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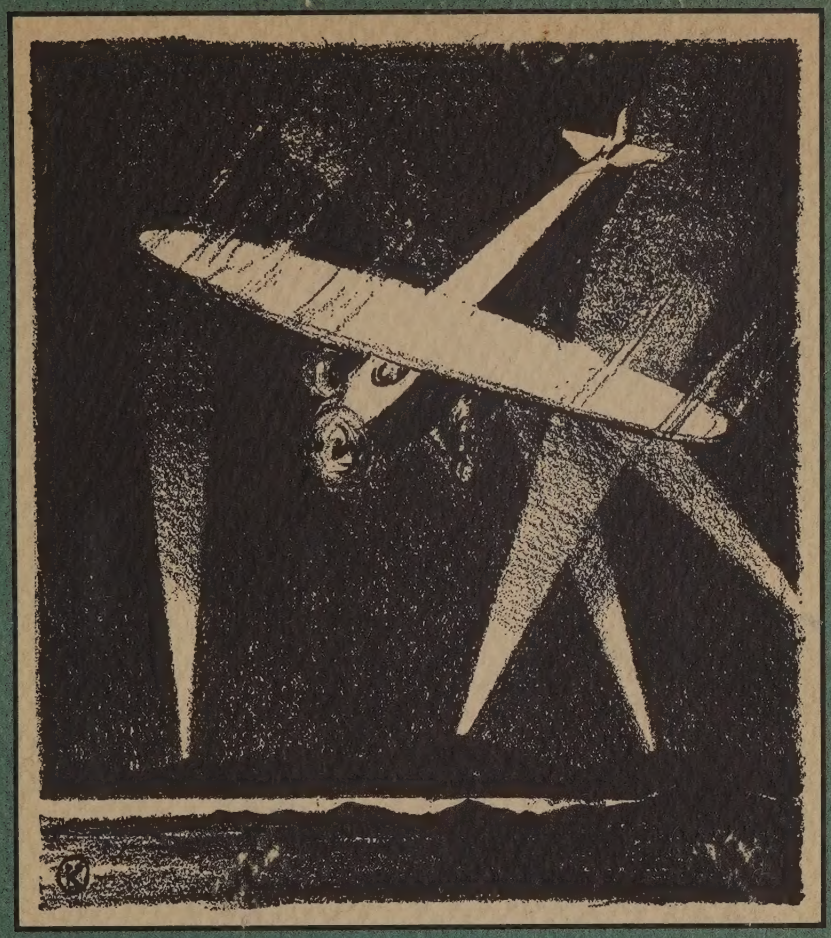

AMERICAN AIRPORT DESIGNS

Originally published in 1930

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AMERICAN AIRPORT DESIGNS

Reprint of the 1930 edition
Foreword by Dominick A. Pisano

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Washington, D.C.

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FOREWORD

In the 1990s we take airports for granted. Virtually every city has one, and every day thousands of passengers routinely board and disembark from a variety of commercial airliners bound for destinations all over the globe. In 1989, for example, Chicago's O'Hare Airport saw a total of 59,130,007 passengers arriving and departing, an average of 162,000 passengers a day.

This was not so in 1928. In that year, the *Aircraft Year Book*, an industry trade publication, noted that only 52,394 passengers were flown from one place to another on regularly scheduled airline service. There were, according to statistics provided by the U.S. Department of Commerce, 800 airports in active operation, with another 800 in the proposal stage, but most of these could not accommodate modern air service. In many cases, airports in the United States were outstripped by the growth of the airways themselves, and thus were incapable of keeping up with expanding aviation activity.

Commercial aviation in the United States in 1928 was experiencing growing pains. But it was clearly a promising business enterprise. The airplane was becoming more widely accepted by the American public and was even looked upon as a machine that would revolutionize American culture. In the past, transportation machines like the locomotive and the automobile had produced widespread social and cultural change. But the airplane could compress time and distance so strikingly that it had the potential to transform America's cultural habits as no means of transport had ever done.

Much of the credit for America's enchantment with the airplane must go to Charles A. Lindbergh. His transcontinental flight in May 1927 and his 48-state tour of the United States in the same year for the Daniel Guggenheim Fund for the Promotion of Aeronautics paved the way for popular acceptance of the airplane. On this tour, during which he covered 22,000 miles and visited 82 cities, one of Lindbergh's objectives was to "promote the development of airports and air communications."

However, it would take more than Lindbergh's efforts for American aviation to become a commercial success. It had to demonstrate that it could overcome its daredevil, barnstorming reputation, an image that had characterized it from the end of World War I. Whether barnstormers—itinerant pilots who did aerial stunts and carried passengers—were wholly responsible for aviation's negative image in the early to mid-1920s is difficult to determine; nevertheless, they were blamed. Although statistics are not readily available, the *Aircraft Year Book* estimated that in 1923 reckless flying was the cause of 179 crashes that killed 85 people and injured 162; in 1924, the publication estimated that barnstormers caused 66 percent of all fatal aircraft accidents.

The Daniel Guggenheim Fund for the Promotion of Aeronautics did much to overcome this unfavorable image by helping to develop safe aircraft and educate the public on the benefits of aviation. In its report for 1926 and 1927, the Fund pointed out that "public support of the airplane in the past has been withheld largely because there is a traditional dread of using an unaccustomed medium such as air for the purposes of transportation. . . . It is a dread which has been stimulated by the sensational recital of airplane disasters."

What better way to win the public's confidence that flying was safe than to improve airline routes? Safety and convenience would obviously be served by providing lighted airways and aids to navigation, and, most important, by establishing permanent airports that were planned and designed for the needs of the air age. Beginning with the passage of the Air Commerce Act in 1926, the Aeronautics Branch of the U.S. Department of Commerce, the agency charged with fostering the growth of air commerce, had actively promoted the construction of airports. William P. MacCracken, Jr., the first head of the Aeronautics Branch, stated firmly: "It is the duty of every municipality to own an airport, just as much as it is its duty to own and maintain the streets, parks, and harbor facilities within its limits."

In this climate of encouragement, in 1928 the Lehigh Portland Cement Company of Allentown, Pennsylvania, spon-

sored a national competition for airport design. The jury included experts on architecture, engineering, city planning, management, and aeronautics. "The further development of commercial and civil aviation is now awaiting the creation of adequate and permanent airports," the competition program asserted. The competition was intended "to suggest practical airport designs of value to municipalities and other organizations which are today creating America's future airports." The company offered four prizes totaling some $10,000, and by November 1929, 257 designs from 35 states around the country had been received for judging. The contestants were judged in four areas: new ideas for airports, new architectural conceptions, engineering features, and influence on city planning.

A result of that competition, *American Airport Designs*, originally published in 1930 by Taylor, Rogers & Bliss, Inc., is herewith republished by The American Institute of Architects Press, some sixty years after it first made its appearance. The book is a fascinating record of the expectations for aviation as a technology and as a commercial enterprise.

The jury unanimously awarded $5,000 to a design by A.C. Zimmerman and William H. Harrison, an architecture firm in Los Angeles. This rationally designed, quadrant-shaped airport won first prize on the basis of what is described as the "very logical organization of its units . . . the provision made for the comfort and safety of passengers and fliers . . . the excellent conception of the relative scale of its various members, and . . . its excellent architectural development."

The competition program outlined criteria for site location, buildings and structures, runways, parking and local transportation, hangar space, etc., that were remarkably prescient about the way such environments should be designed in the future. Zimmerman and Harrison planned their airport with these requirements in mind. Passengers arrived at the terminal by means of a broad plaza that adjoined two main thoroughfares. Planning provided for future access by subway or railcar. The plaza by which one approached the airport was designed as a park that contained parking spaces for automobiles and was arranged in a semicircle around the passenger terminal. A triangular parking area contained a small hotel, playgrounds, a swimming pool, and shops and stores.

As mandated by the competition program, Zimmerman and Harrison designed the waiting room of the passenger terminal much like a railway station, with ticket booths, baggage and freight-handling areas, a restaurant, newsstand, and other conveniences. Passengers reached their waiting aircraft by means of ramps and underground passages with tunnels that took them directly to the airplane. These tunnels, much like the passenger boarding bridges in modern airports today, were retractable and provided the passenger with protection from the elements and safety from the whirling propellers of the aircraft.

The competition program also stressed the safety of the passenger, and this too was a chief concern of the first prize winner. The text of *American Airport Designs* points out that in Zimmerman and Harrison's design, passenger safety "is further enhanced by arranging the runways on the flying field so that take-off or landing can be made when the wind is in any direction. These runways are joined by narrower taxi strips and a broad semi-circular apron which gives access to either end of each runway without interfering with other planes that are arriving or departing."

Despite such utilitarian features, all of the prize-winning designs have one striking architectural similarity: their angular, geometric, and ornamented Art Deco appearance, a look out of keeping with buildings that were supposed to be the focal point for a modern transport machine. This is not surprising. The most modern American airliner in service in 1929 was the boxy Ford Trimotor, a curiously unmodern-looking machine. The truly modern airliner of the era—the streamlined Douglas DC-3—was another seven or so years away.

Yet, even with the appearance of the DC-3, which helped to produce the streamlining movement in American industrial design and architecture, the esthetics of modern airports in the United States were to remain constrained until the mid- to late 1950s. This is when dramatic structures like Hellmuth, Yamasaki, and Leinweber's St. Louis Airport and Eero Saarinen's Dulles International appeared. As John Burchard and Albert Bush-Brown have pointed out in *The Architecture of America: A Social and Cultural History*, the period between 1913 and 1933 "was not yet time to wonder what the airplane said about the aesthetics of the city; not time even to guess that the freedom of movement between old civilizations and new might affect them both profoundly. Hangars might be seen to have an admissible beauty but it was a beauty that belonged to the engineer and one that seemed to most architects not to have any transferable suggestions for their less utilitarian needs. So the effect of the airplane was postponed to the future."

Nevertheless, *American Airport Designs* is a significant document of the era when the airplane was just beginning to have an impact on American life. As one of the few published documents on the relationship between aviation and society and culture, it deserves a new audience that can now fully appreciate its importance, especially given the astonishing development of commercial aviation in the intervening sixty years.

Dominick A. Pisano
Curator, Aeronautics Department
National Air and Space Museum
Smithsonian Institution
Washington, D.C.

AMERICAN AIRPORT DESIGNS

Originally published in 1930

A glance into the future, visualizing the modern American airport as conceived by the authors of the design winning first prize in the Lehigh Airports Competition. See the plans on pages 14 and 15. Drawing prepared by Francis Keally from the designs of A. C. Zimmerman and William H. Harrison

AMERICAN AIRPORT DESIGNS

Containing 44 Prize Winning and Other Drawings from the Lehigh Airports Competition ~ the First National Contest for Designs of Modern Airports held in the United States ~ Sponsored by the Lehigh Portland Cement Company ~

With Analysis of Designs
by Archibald Black

PRICE $3.00

PUBLISHED FOR THE

LEHIGH PORTLAND CEMENT COMPANY

BY

TAYLOR, ROGERS & BLISS, INCORPORATED

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DEDICATION

UNDER the conditions of the Lehigh Airports Competition, the designs which received prize awards or honorable mentions are dedicated to the American Public as a means of stimulating interest in far-sighted and economically sound airport development. Privilege of publication and exhibition of any designs submitted in the competition was specifically reserved to the Lehigh Portland Cement Company for this purpose. Ownership of the original drawings (and the right of patent protection for patentable features) remained with the authors. It was further agreed with the competitors that publication of their designs would be accompanied in all cases by credit to the respective authors.

To further the purpose of this competition, the Lehigh Portland Cement Company, while retaining copyright protection for the book, will grant privilege of quotation, and will supply original photographs to facilitate reproduction of the drawings, upon application of responsible individuals, organizations, or institutions interested in furthering the progress of civil and commercial aeronautics in the United States.

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INTRODUCTION

by CLARENCE M. YOUNG
Assistant Secretary of Commerce for Aeronautics

CIVILIZATION has always advanced hand in hand with the development of transportation. American genius, therefore, has always concerned itself with the problems of improving transport facilities.

These problems have confronted the human race ever since man built his first crude ox-cart and found it necessary to widen his footpaths into roads; for, just as boats require docks and harbors, just as trains require roads of steel, just as motor cars need streets and highways, so must aircraft have airports.

Air commerce has definitely emerged from the experimental stage and is rapidly taking its place in the commercial and industrial life of the Nation. To assure maximum development and utilization of this new transport medium, however, suitable facilities must be provided for the accommodation of each class of flying operations, scheduled air transport, private flying, and miscellaneous aerial services.

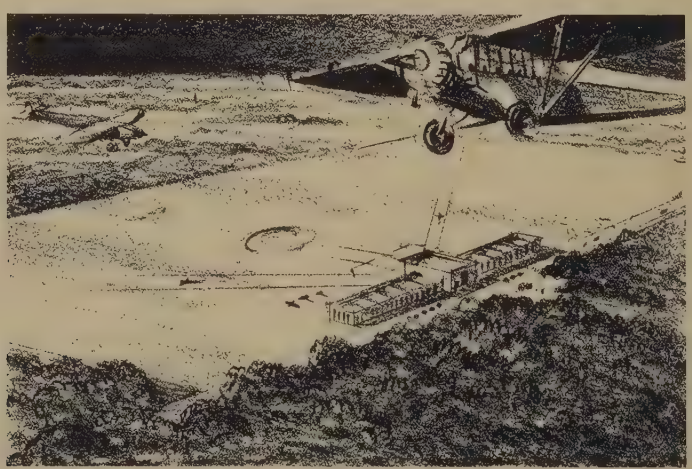
Obviously, in order that air transport may meet the requirements of business and render its fullest possible measure of service, it is essential that aircraft be operated over definite routes and that the operating schedules be maintained day and night through all kinds of weather with the maximum degree of safety and reliability. To assure maintenance of schedule, the aircraft must be airworthy, the pilots must be competent, and the airways must be provided and equipped with necessary aids to air navigation. All of these contributing factors, however, would be almost useless if there were no airports. For just as lighthouses and other aids to marine navigation would be of small value if there were no ports or harbors in which the ships could anchor and find

shelter, and if there were no docks to which they could moor to load and unload their cargoes, so must airports be provided to link the airways together and thereby make the system complete and effective.

More than 1000 municipal, commercial, and private airports have already been provided in the United States, and nearly 1400 more are proposed for early development.

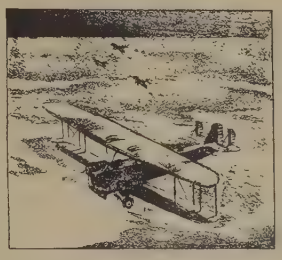
The Lehigh Airports Competition has doubtless been instrumental in crystallizing the interest of many of America's architects and engineers and in focusing their attention upon the problems of airport design and development. It is believed that the general publication of the best designs submitted will stimulate public interest in airport development and educate the layman to a broader conception of what his local airport should be. Once this conception is firmly implanted in the public mind, it seems not unreasonable to assume that municipal bond issues and public financing for airports will be materially facilitated, and that the funds so appropriated will more nearly approach the amount necessary to provide permanent airports, adequately equipped with proper buildings and facilities.

Because of the widespread interest being shown in the subject of airport design by architects, engineers, and municipal officials, I feel that the publication of constructive suggestions will prove of material aid in developing the Nation's airports and hence in accelerating the growth of America's air commerce.



AMERICAN AIRPORT DESIGNS

The Lehigh Airports Competition and Its Contribution to the Advancement of Civil and Commercial Aeronautics



TOWARD the end of the year 1928, the aeronautics industry in the United States found itself literally upon the horns of a dilemma. During the preceding years, and particularly since the epochal flight of Charles A. Lindbergh from New York to Paris, there had been witnessed a phenomenal interest in aeronautics on the part of laymen, manufacturers and financiers. Civil and commercial aeronautics suddenly came out of the doldrums into which it had fallen since the close of the World War. Extraordinary progress was made in the development of airplanes and airplane engines. Young men turned to flying by the thousands and became expert pilots. The success of the air mail service paved the way for the inception of commercial passenger transportation by air. So much interest was displayed in these technical problems of actual flying that for a period of several years the creation of adequate ground facilities was neglected. In the fall of 1928, many far-sighted experts realized that the future progress of civil and commercial aeronautics rested almost wholly upon the establishment of adequate airports to serve America's newest transportation system.

While many progressive municipalities were already taking steps to provide airports for themselves, and while the leading transportation companies were similarly active in creating ports of call along their air routes, there were definite and obvious problems to be solved. The first of these was to stimulate further activity on the part of municipalities and transportation companies in the creation of adequate ground facilities, and the second was to establish standards of a sort that would guide the expenditure of hundreds of millions of dollars already available for airport work to the end that this money would not be wasted in short-sighted development of airports but would be spent wisely to meet the future as well as the immediate needs of the industry.

Of the two, the latter was by far the more important. There was no precedent for airport design. European practice could not be accepted, because even in Europe changes were constantly being made —notably at Croyden, England, and at Templehof Field in Berlin—to correct errors in the original layouts and facilities.

This was the condition of affairs when the Lehigh Airports Competition was first conceived and its sponsorship undertaken on a purely non-commercial basis by the Lehigh Portland Cement Company, of Allentown, Pa. It was recognized by those responsible for the competition that, of the approximately 800 airports in existence at the end of 1928, a mere handful were anything more than flying fields consisting of a reasonably large area of graded land with more or less temporary structures in the form of hangars, a service shop or two, and possibly a manager's office. Some of the older fields were already becoming obsolete with rapidly depreciating structures that would soon have to be replaced by permanent buildings if the port were to serve as a real transportation center. The problem therefore was not only to stimulate airport development and to create standards to guide future work, but also to encourage the establishment of permanent structures and facilities and to plan for the future.

Consequently the announced purpose of the Lehigh Airports Competition was "to crystallize public attention [*Continued on page 9*]

THE JURY OF AWARDS ~ LEHIGH AIRPORTS COMPETITION

Seated, left to right: GEORGE B. FORD, city planner and airport consultant to the War Department; RAYMOND HOOD, architect, Chairman of the Jury; and DR. GEORGE W. LEWIS, Director of Research of the National Advisory Committee for Aeronautics of Washington, D. C.

Standing, left to right: E. P. GOODRICH, civil engineer and airport consultant to the Chinese National Government; MAJOR JOHN W. BERRY, Manager of the Cleveland Municipal Airport; CHARLES S. (Casey) JONES, noted flier and President of Curtiss-Wright Flying Service; COLONEL WILLARD W. CHEVALIER, publishing director of *Engineering News-Record;* PARKER MORSE HOOPER, architect and editor of *The Architectural Forum;* PROFESSOR WILLIAM A. BORING, Director of the School of Architecture of Columbia University; and Francis Keally, architect and professional advisor to the competition.

upon the need for well-designed and properly planned airports to facilitate the future expansion of commercial and civil aeronautics. Architects, engineers, and city planners, preferably working in collaboration with each other and with representatives of the aeronautics industry, and those with practical flying experience, can and should solve America's airport problem. This competition is designed to present to the public designs of practical as well as inspirational value to guide the development of airports, present and future."

It was clearly recognized that most airports must start in a modest way while providing for future growth when air traffic may demand added facilities. [*Continued on page 10*]

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For this reason the committee selected an area midway between the maximum and the minimum permissible area for a general purpose flying field, but at the same time required the equipment of this port with structures of comparatively modest size, though complete in all details, and capable of expansion. To quote from the conditions of the competition:

Conditions of the Competition

"It is the purpose of this competition to suggest practical airport designs of value to municipalities and other organizations which are today creating America's future airports. The minimum requirements specified are conceived by the program committee as being desirable for a complete airport but are not of excessive size. For this reason the competitors are urged to keep the general scale and conception of the design within entirely practical bounds for present-day development.

"It is required . . . that in the design and arrangement of the various units, except the flying area itself, provisions shall be made for future expansion which will at least double the capacity of all such units without requiring the removal or abandonment of the original elements."

To achieve these ends, a committee of nationally recognized experts in the four fields of architecture, engineering, city planning, and aeronautics was organized, and this committee was given the responsibility for establishing the competition requirements. The members of the committee, of which Harvey Wiley Corbett, internationally famous architect, was chairman, are given on page 9.

Competition Requirements

While the determinations of this committee necessarily exerted considerable influence upon the extent and nature of the ground facilities shown in the competition drawings, and thus to a certain extent predetermined the appointments of an ideal airport, every effort was made to give the competitors the utmost leeway in creating plans and arrangements unhampered by precedent or hard and fast restrictions. A very condensed summary of these requirements as established by the program committee will serve to indicate their character and the extent of their influence.

Nature of Site

The site was assumed as a sea-level field of practically uniform grade large enough to provide an effective landing area of 3500 lineal feet in all directions. This effective landing area must be protected by marginal areas under the control of the airport, the extent of which was seven times the height of any structure adjacent to the landing area. Because of the practical limits in cost of developing suitable all-over surfaces for a large field, paved runways not less than 100 feet in width were required for the landing and take-off of planes. These were so to be disposed as to provide for safe landing into the wind in each of the eight cardinal and quarter points of the compass, *i. e.*, a minimum of four runways.

Types of Buildings

Among the buildings called for in the program was a passenger terminal with complete facilities for the public, the transportation companies and the pilots using the field, with provision for immigration and customs offices and for complete traffic control facilities. Provision was required for the protection of passengers when enplaning and deplaning. Other buildings included hangars, repair service stations, a hotel of small size, various concessions from which income for the airport could be derived and such essential structures as would normally be required for the care and maintenance of the airport. To quote from the competition program, "Nothing in these conditions shall be deemed to govern or limit the competitors in developing logical relationships between the units, the height of the structures, or their architectural character." Thus the program committee allowed the freest expression of new ideas and conceptions. The designs published in this book may therefore be taken to represent the uninfluenced

thoughts of American architects, engineers, city planners and aeronautics experts in the solution of major airport design problems.

Timeliness of Competition

That this competition was exceedingly timely, and keenly aroused the interest of the best professional minds of the country, was made evident at the close of the contest on November 18th, 1929, when 257 designs were received for examination by the jury of awards. These designs came from 35 states and represented the work of 321 individuals, there being many designs submitted by several collaborators jointly and in some cases one designer submitted more than one entry. Further evidence of the timeliness and value of the Lehigh Airports Competition is found in the current statistics of the Department of Commerce. At the end of 1928, there were approximately 800 airports or flying fields in use in the United States and another 800 proposed for immediate development. In December, 1929, the Department of Commerce reported 1509 airports in active use and 1278 more ports either proposed or in process of construction. More than 4,000 other fields were on record on which aircraft landings could be made, but these were not classified as airports. Of the airports in actual use in December, 1929, 440 were municipal, 465 commercial, 278 intermediate fields, 86 government fields and 240 auxiliary landing fields. Thus within the year in which the Lehigh Airports Competition was conducted the number of active airports nearly doubled, and the number of airports proposed or in process of construction remained nearly equal the number already in operation. It must be appreciated of course that even the airports in use are by no means fully developed and that the results of the competition are of equal value to the officials in charge of these fields and to the men responsible for the design and construction of new ports.

Results of the Competition

In making any appraisal of the results of this competition and the value of the designs herein published, this background of current conditions must be taken into account because airport theories and airport problems have been changing almost daily during the last several years and are likely to change for some time in the future.

Out of the competition there has undoubtedly come a group of ideas that may very definitely influence American airport design during the next five or ten years. So far as is known, most of these ideas have never yet been applied to any project, whether European or American. This may be due to the fact that air traffic has not yet become heavy enough to warrant development to the degree indicated; but it is significant that apparently no comprehensive plans have been prepared for existing airports in which these features have been provided for to the extent shown in the competition drawings. These new ideas may be grouped into four categories.

New Ideas for Airports

In the aeronautical group, the first contribution made by the competition drawings, viewed as a whole, is the frequent suggestion that taxi strips be provided upon which arriving and departing planes may travel from the passenger terminal or hangar to each runway. These taxi strips serve two important functions. They keep the runways free of planes taxiing into position, and they provide smooth traffic lanes during the taxiing operation so that passengers are not jolted or inconvenienced while preparing for take-off or immediately after landing. The psychological importance of this feature was emphasized by the aeronautics members of the jury of awards, for it is recognized that passengers unfamiliar with flying operation are most nervous during the preliminary period before the plane is in the air and, if they are then subjected to rather rough treatment, their timorousness is enhanced rather than abated.

A second feature developed by a number of the competitors is the use of double or parallel runways, one of which is devoted exclusively to landing and the other for take-offs. In some instances, the designs showed these par-

allel runways completely developed; in a number of other cases, the initial development of runways was so planned that the double system could be installed later if air traffic demanded this safety feature.

Where incoming and outgoing traffic is segregated in this manner, and where the runways are kept free of slow-moving planes by use of special taxi strips, the utmost safety is provided and the traffic capacity of the field is enormously increased. While many aeronautics experts at present feel that runways should be used only for take-off purposes and that the landing of planes should be on a soft-surfaced field, this new conception seems to be a logical and economical answer to the problem, especially in view of the fact that where hard runway surfaces are now provided, pilots prefer to land upon them in bad weather rather than upon natural surfaced areas.

New Architectural Conceptions

Among the architectural conceptions of greatest interest are the provisions made for the comfort and convenience as well as the safety of passengers; the frequent submergence of terminal buildings so that a considerable part of their useful areas are below ground level; and the indication that the ultimate development of an airport will provide for many profitable concessions, such as hotels, restaurants, automobile parking areas, airplane sales rooms or exhibition halls, and various recreational structures. Attention should also be called to the general appreciation of the importance of solidity and stability which is architecturally expressed in the buildings themselves. The designers recognized the psychological importance of giving to air transportation that feeling of permanency, reliability and dignity which is characteristic of the great railroad terminals and of the modern steamship docks.

Engineering Features

Owing to the relatively simple nature of the drawings called for in the competition, there was little opportunity for the designers to develop or even indicate solutions to the engineering problems involved in their conception. The importance of engineering services in connection with airport development, however, was very clearly demonstrated by the frequent use of underground structures; by the employment of long-span roof structures over loading and unloading docks or in hangars; by the occasional suggestion of cantilever trusses and parabolic masonry arches; by the indication of underground rapid transit systems serving the airport; and by the general employment of hard-surfaced pavements for roadways, taxi strips, runways, and the broad aprons connecting the hangars, the passenger terminal and other service structures. The competition did not call for a full development of lighting systems, nor for an indication of drainage work, nor the ordinary utilities serving such a group of important buildings, but the least play of the imagination will bring one quickly to the realization that airport development requires as much engineering guidance and skill as it does the services of aeronautics experts, architects and city planners.

Influence Upon City Planning

In the city planning division, the competition has brought out rather forcibly: (1) that airports must be definitely related to the highways and traffic arteries of the community they serve: (2) that airports serve many of the functions of a public park in providing great open spaces for public health and enjoyment and (3) that the marginal areas surrounding the landing fields (which must be kept free of encroaching structures) offer exceptional opportunity for development of public recreation grounds, playgrounds and amusement parks that contribute definitely to the city plan, even though commercially operated. If there is a more universal conception of the relationship of airports to the city plan and particularly to its park system, there will be more general support for the financing and development of municipal air fields as civic enterprises and a more generous welcome to those commercial fields which are erected within or adjacent to city limits.

PRIZE WINNING DESIGNS

ON the following pages are reproduced the four designs awarded prizes in the Lehigh Airports Competition. These prizes were as follows: First prize, $5,000, second prize, $2,500, third prize, $1,000, and fourth prize $500, making a total of $9,000 awarded to premiated designs. In addition, twelve honorable mentions were awarded by the jury, each carrying a prize of $100, bringing the total prize money provided by the Lehigh Portland Cement Company to $10,200. The honorable mention designs are published in a later section of this book beginning on page 23.

First Prize Design

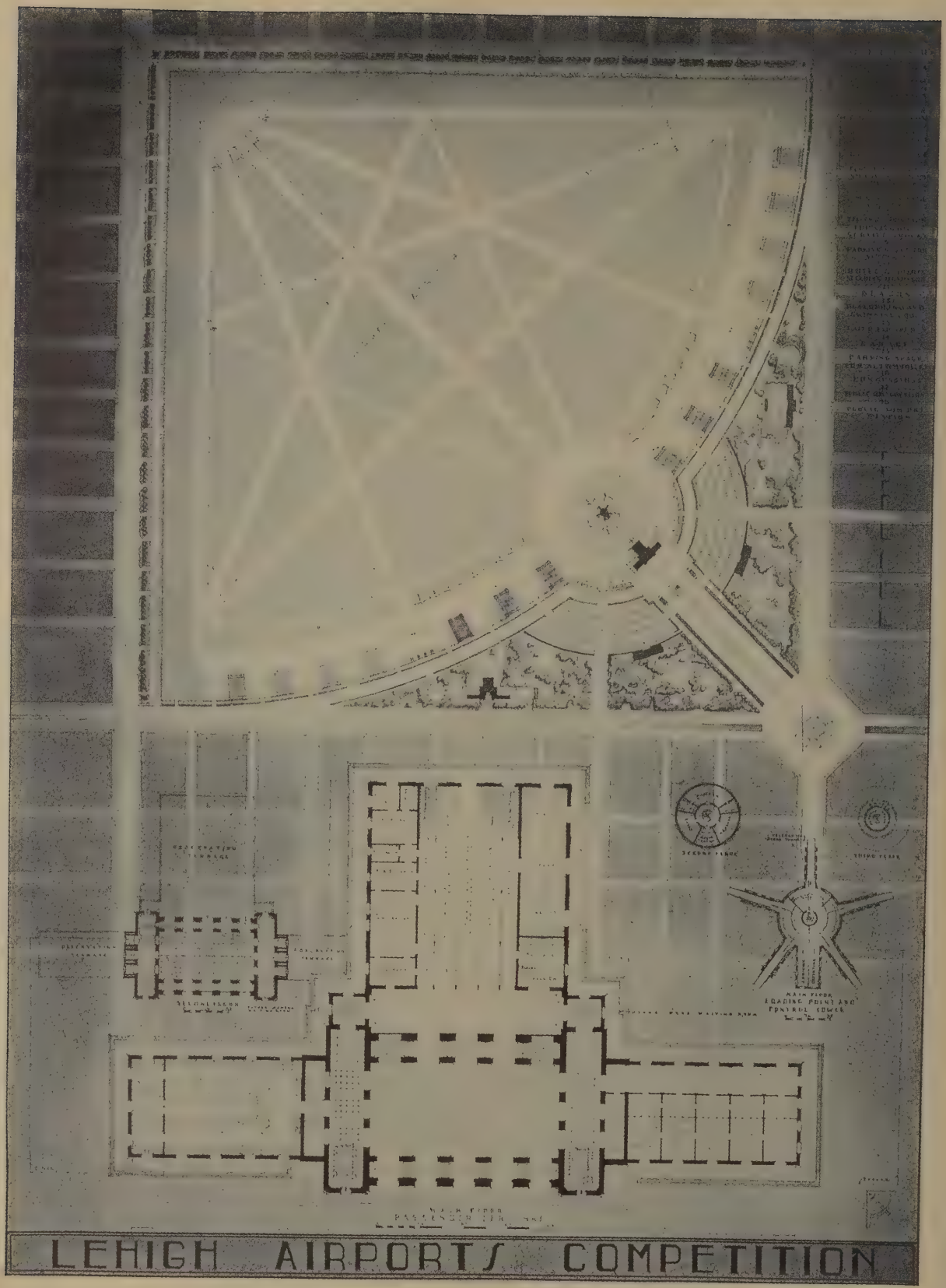
A. C. Zimmerman and William H. Harrison, associated architects and engineers of Los Angeles, California, were unanimously awarded the first prize of $5,000 by the Lehigh Airports Competition jury for their design which is reproduced on pages 14 and 15. Their "quadrant airport" was particularly commended by the jury for its very logical organization of its units, for the provision made for the comfort and safety of passengers and fliers, for the excellent conception of the relative scale of its various members, and for its excellent architectural development.

Visitors and passengers reach the airport terminal building through a broad plaza at the junction of two important boulevards, or through extensions of lateral streets from each of these two main highways. Provision has been made for an underground approach of a subway or railway when the traffic load is sufficient to warrant this feature. The approach plaza is developed as a dignified park and is provided with huge parking spaces for automobiles arranged in a great semi-circle about the passenger terminal. This building has a waiting-room very similar to that of railroad stations, with ticket and information booths, baggage-rooms, a large restaurant and lunch counter, news-stands and similar facilities. Provision has been made for mail, express and freight handling, with offices for immigration, customs and public health officials controlling all incoming passengers from foreign ports, as well as for executives of air transport companies utilizing the port.

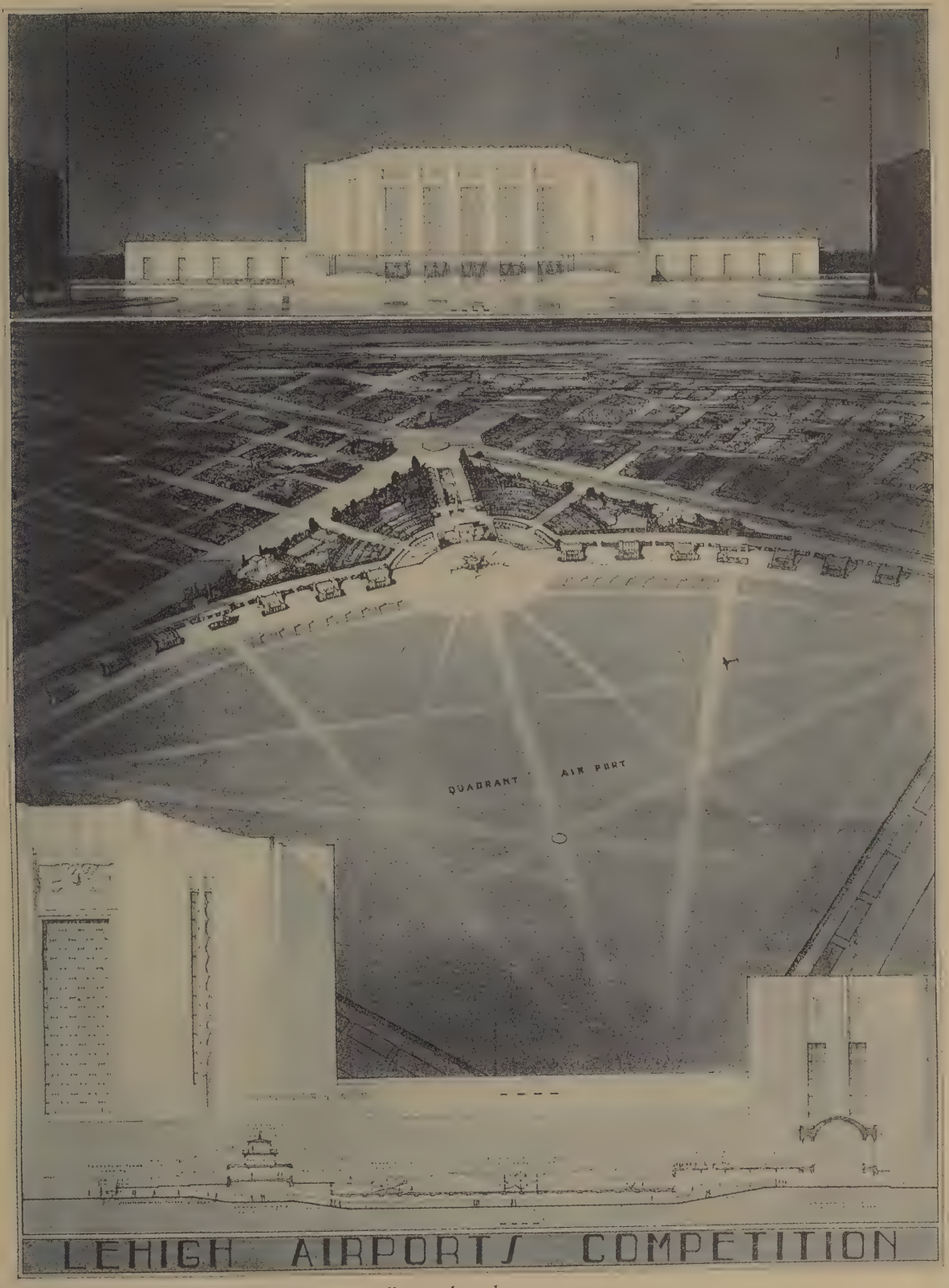
The passengers go down separate ramps to underground passages leading to a star-shaped structure at the edge of the flying field, where telescopic steel tunnels may be extended out on short tracks to reach the doors of arriving or departing planes. These tunnels are retracted while the plane is maneuvering into position. The purpose of this arrangement is to keep passengers protected from the weather at all times and also to keep them away from the revolving propellers on the plane and absolutely to control their access to the flying field itself. Thus provision is made for maximum safety of passengers and planes, which is further enhanced by arranging the runways on the flying field so that take-off or landing can be made when the wind is in any direction. These runways are joined by narrower taxi strips and a broad semi-circular apron which gives access to either end of each runway without interfering with other planes that are arriving or departing.

The quadrant shape of the airport places all of the buildings in a triangular area occupying one corner of the field, except the hangars, service shops, fire stations, and other field facilities which are grouped along the semi-circular edge of the field. The triangular parking area on either side of the approach plaza is developed for the benefit of visitors, patrons and the neighboring community, and contains a small hotel, playgrounds, a swimming pool, stores, shops, and room for such other features and profitable concessions as may subsequently prove desirable.

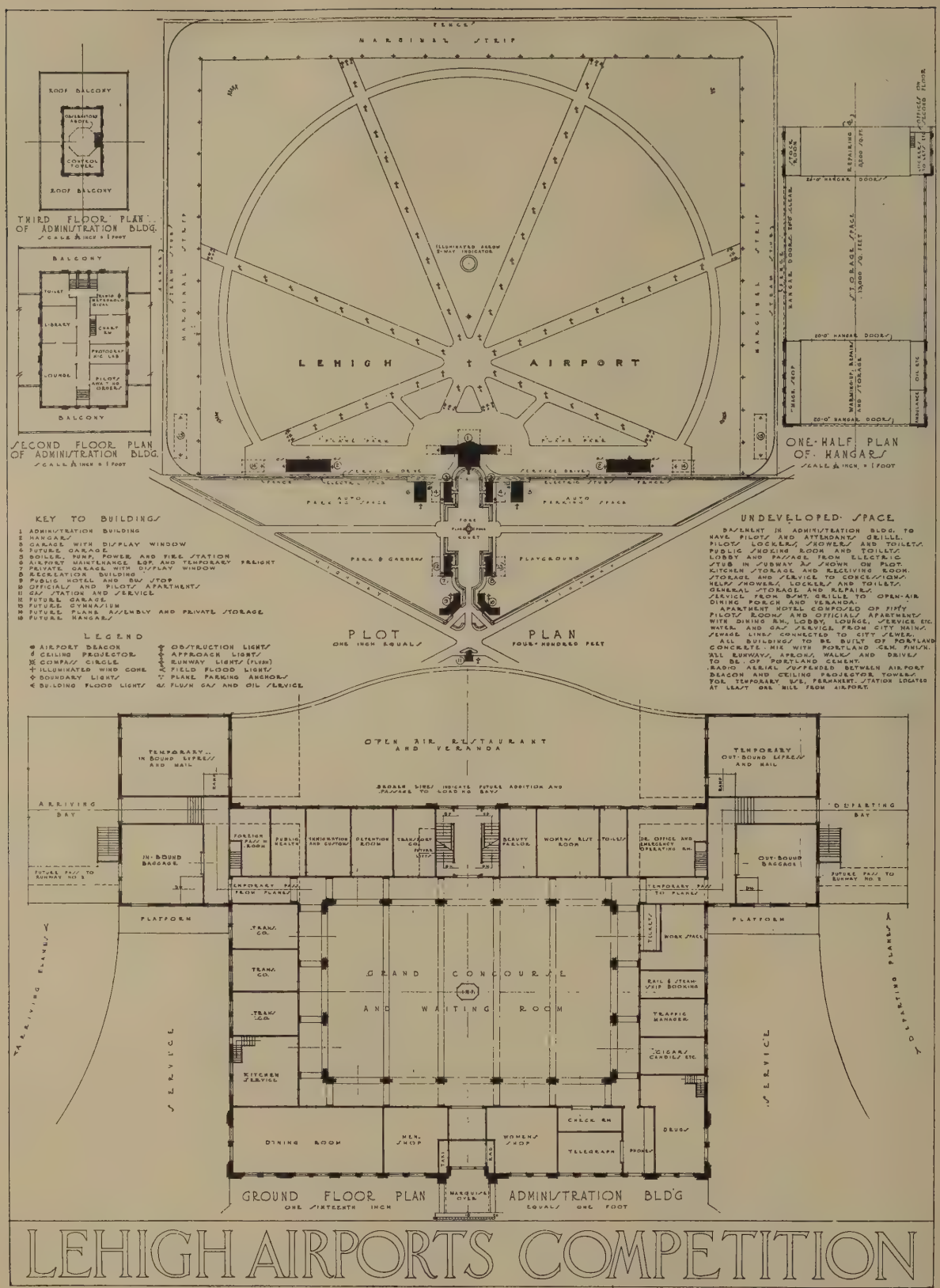
Of particular interest is the ingenious manner in which the loading point has been developed with underground foot passageways from the passenger terminal. The architectural development of the passenger terminal building is also worthy of special commendation, combining [*Continued on page 22*]



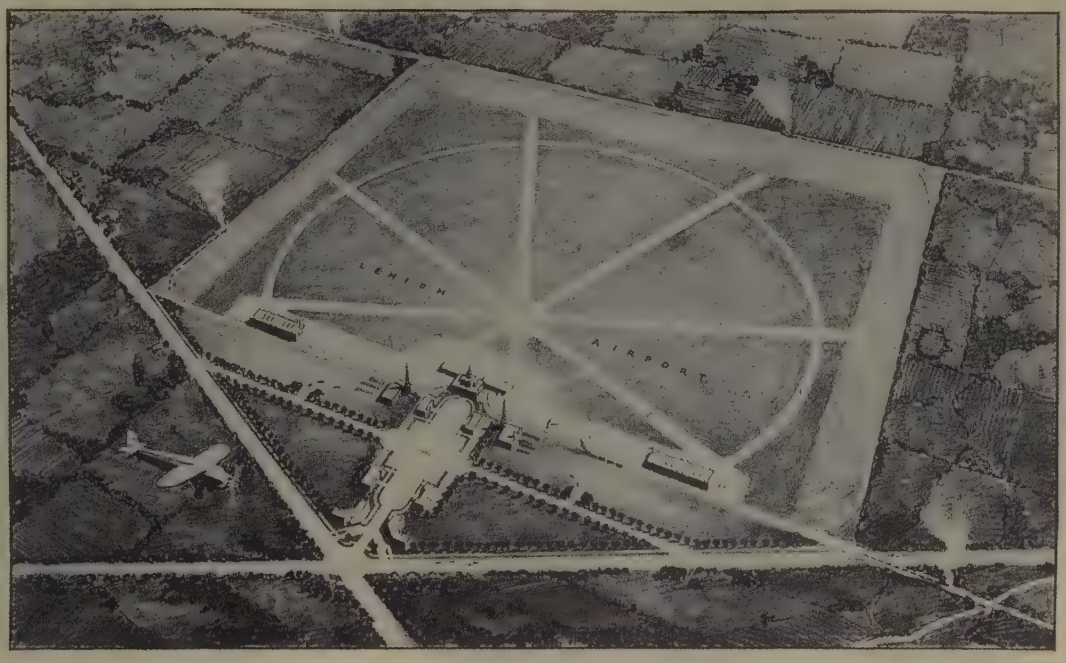
First Prize $5,000. Designed by A. C. Zimmerman and William H. Harrison, Associated Architects and Engineers, Los Angeles, California



A quadrant-shaped airport, notable for its excellent scale and arrangement, and its unique passenger-handling facilities. See frontispiece

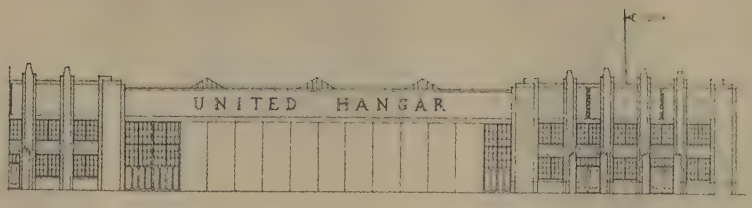


Second prize of $2,500 in the Lehigh Airports Competition awarded to C. Gifford Rich, Architectural Designer, of Chicago, Illinois

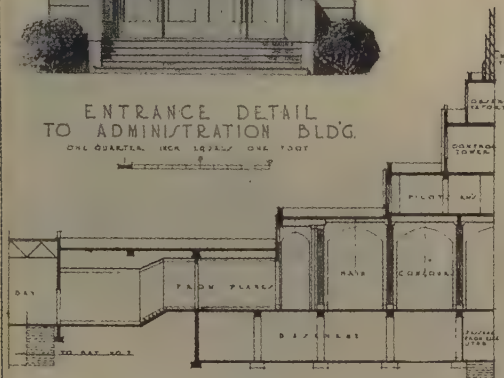


AIRPLANE VIEW

ENTRANCE DETAIL
TO ADMINISTRATION BLD'G.
ONE QUARTER INCH EQUALS ONE FOOT



PART ELEVATION OF HANGAR

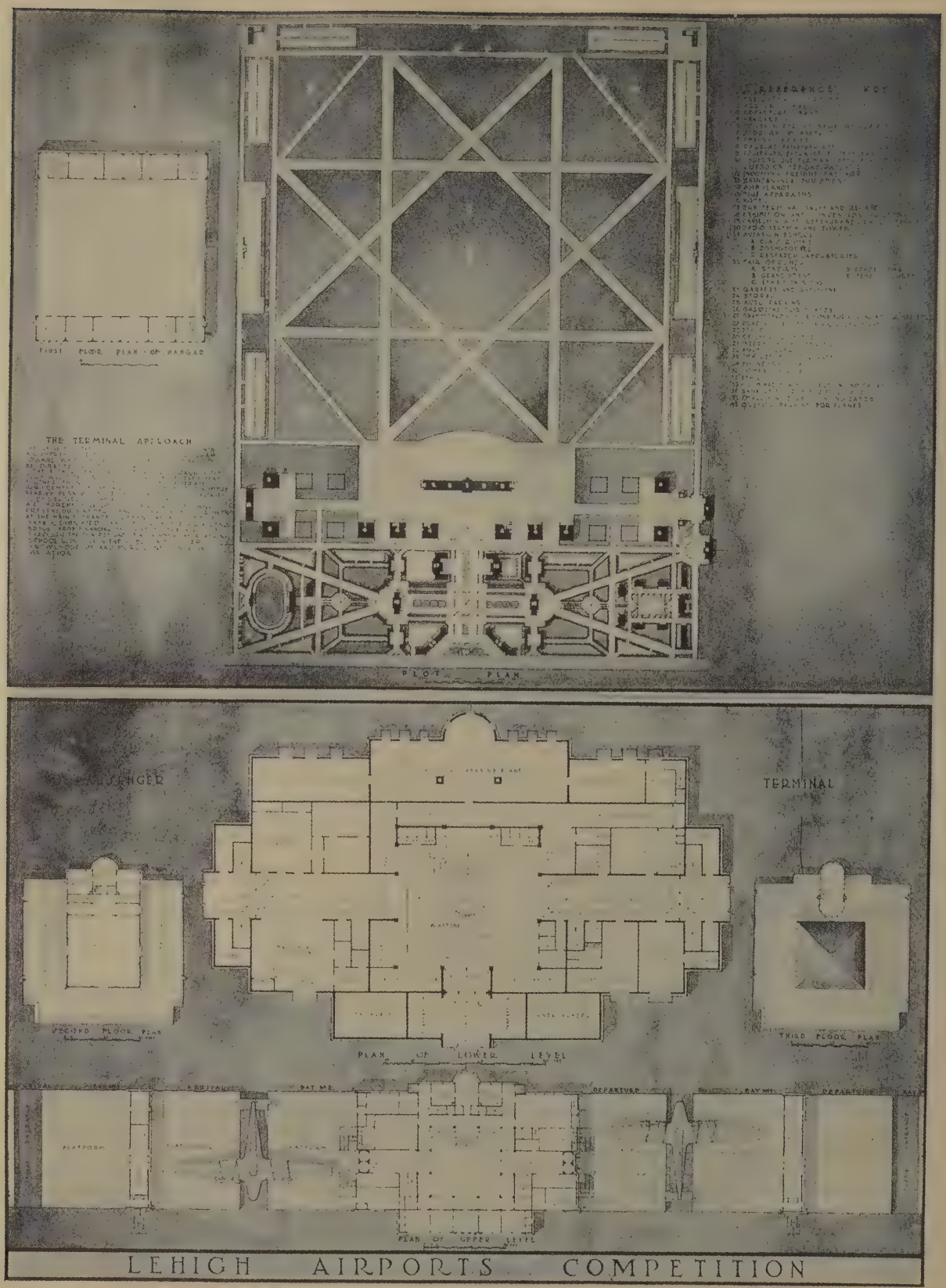


HALF LONGITUDINAL SECTION
ONE-SIXTEENTH INCH EQUALS ONE FOOT

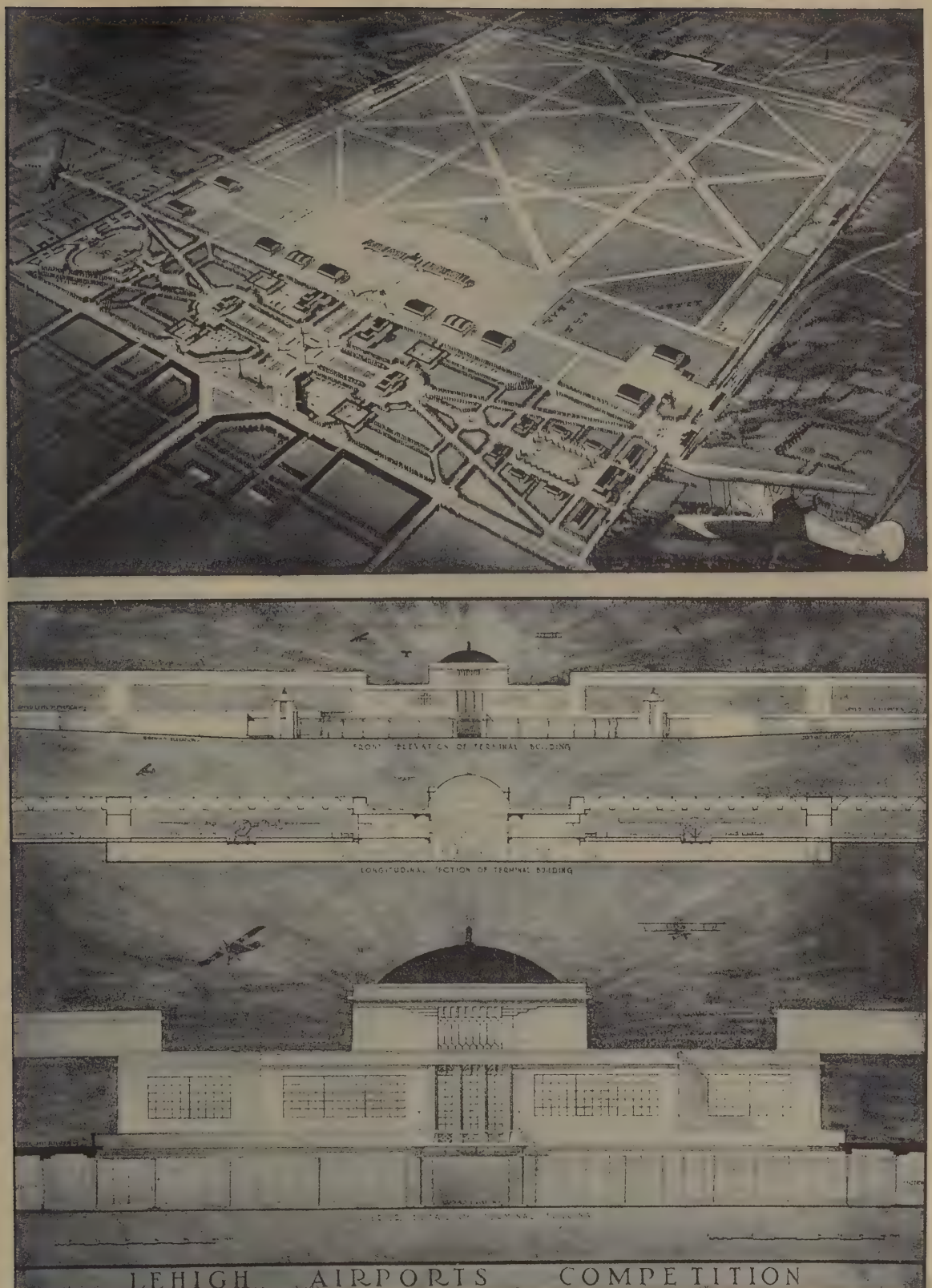
ELEVATION OF ADMINISTRATION BLD'G.
FROM FORECOURT APPROACH
ONE-SIXTEENTH INCH EQUALS ONE FOOT

LEHIGH AIRPORTS COMPETITION

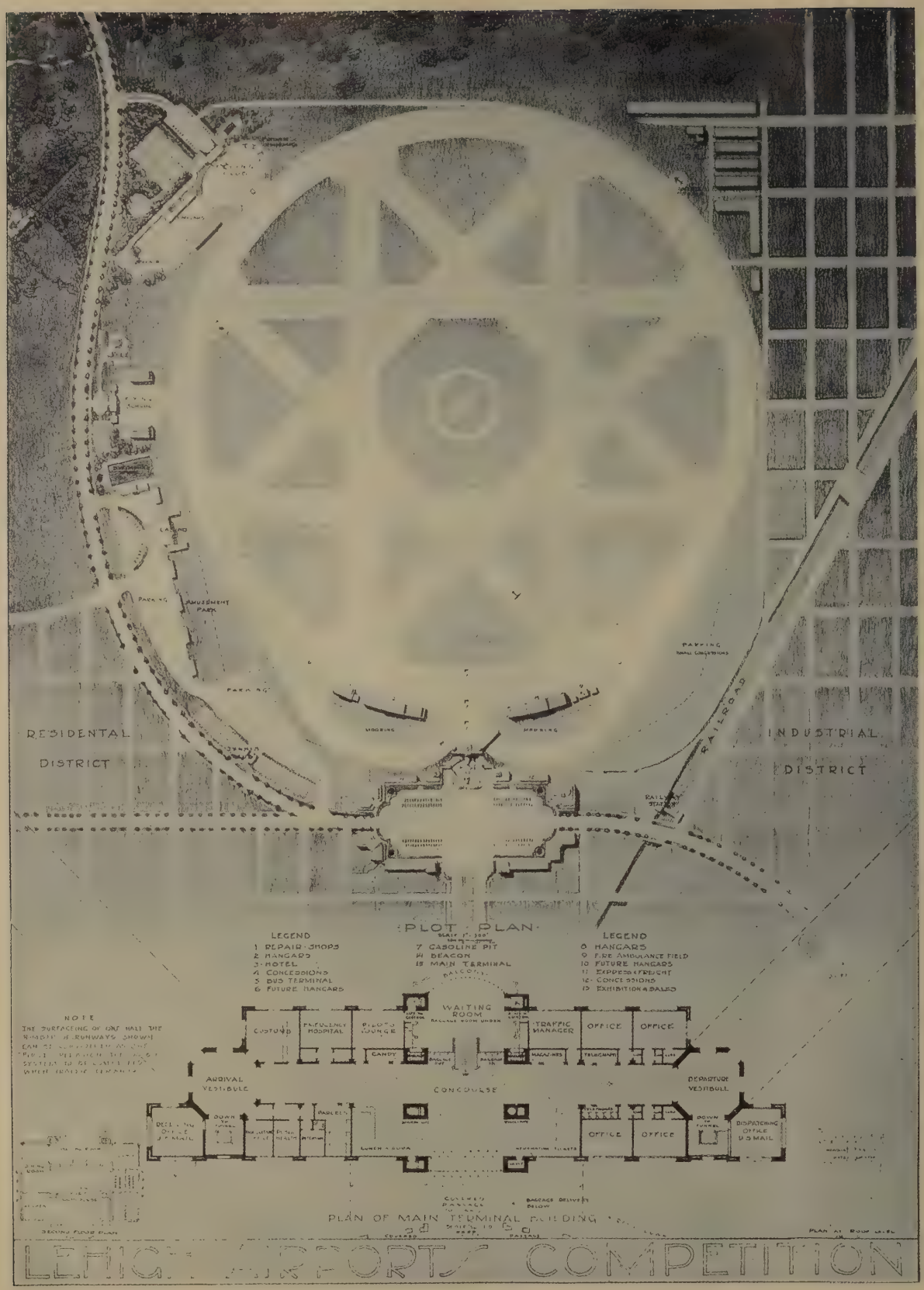
A simple plan employing radial runways joined by a circular taxi strip, with a logical organization of the building units



Third prize of $1,000 awarded jointly to Odd Nansen, East Orange, New Jersey, and Latham C. Squire, New York, N. Y; City planners



Double runways separating landing and departing planes, a partly submerged terminal building, and provision for a future civic center feature this plan



Fourth prize of $500 in the Lehigh Airports Competition awarded to Will Rice Amon, Architect, of New York, N. Y.

Direct access from the public plaza to the passenger terminal building, with its covered loading docks, merits notice

PRIZE WINNING DESIGNS

[Continued from page 13]

beauty, stability, and a feeling of permanency with economy of construction.

A. C. Zimmerman is a graduate of the University of Southern California and Beaux Arts Institute of Design, and has been the recipient of awards in various competitions and from the Southern California Chapter of the A. I. A. He is the architect in charge of the Western Air Express Terminal of Los Angeles.

William H. Harrison graduated in architecture from Cornell University where he was awarded the graduate fellowship. His training was completed in leading architectural offices in New York, Indianapolis, and Los Angeles. The two winners are now practising as associated architects and engineers.

Second Prize Design

The design submitted by C. Gifford Rich of the office of Charles Wheeler Nicol, architect, of Chicago, won second prize of $2,500. Mr. Rich's training as an architect and engineer was supplemented during the War by aeronautical experience as a flying officer in the Royal Flying Corps. His experience as scout pilot in England and France on the more or less primitive landing fields led him to an extensive study of modern airport requirements and this study is well expressed in his design.

This scheme employs a rectangular flying field with a series of runways crossing each other at a point off the center of the field and near to the passenger terminal building. This structure and the hangars are within the limits of the rectangular field, while other units including maintenance shops, service buildings, a hotel, stores and other concessions are arranged in a triangular area adjacent to the field which is enclosed by two intersecting highways. Provision has been made for the comfort and protection of passengers in a well-planned terminal building which is flanked by covered loading docks that may be extended to double their present size when traffic demands added facilities. The administration building is simple and modernistic in design. From its broad, outdoor terrace passengers and visitors may watch the flying activities.

Third Prize Design

The third prize of $1,000 was awarded jointly to Odd Nansen of East Orange, N. J., and Latham C. Squire of New York City, both of whom are associated in city planning design with the Technical Advisory Corporation. Their plan employs a rectangular field with a series of parallel runways crossing each other in four directions, and with all of the buildings required for airport activities grouped within the limits of the flying field itself. Adjacent to these buildings, provision has been made for a great civic center and park which may be added whenever airport traffic and demands of the municipality call for its development. The passenger terminal building is largely below ground level to prevent it from becoming an obstacle to flying, with only a pair of loading docks on either side of a central superstructure visible upon the field.

Fourth Prize Design

Will Rice Amon, architect, of New York, received the fourth award of $500 in the Lehigh Airports Competition for a design employing a circular field crossed by parallel runways with a modernistic terminal building and hangars placed in an elliptical extension of the flying area. The terminal building employs covered loading and unloading docks which extend at an angle from the terminal structure to span special taxi strips which pass around the hangars at the edge of the field. The marginal areas have been employed for automobile parking, plane mooring, an amusement and recreation park; while suggestions have been made for a flying school, flying club and manufacturing plants at other points around the perimeter of the flying area. The author of this plan is a graduate of the Massachusetts Institute of Technology and holder of two LeBrun Travelling Scholarships. He has been associated with Delano and Aldrich of New York for the past six years.

HONORABLE MENTION DESIGNS

THE original offer of $10,000 in prizes made by the Lehigh Portland Cement Company was increased by $200 at the request of the Jury of Awards in order that twelve instead of ten honorable mentions might be awarded to designs considered worthy of such recognition. On the following pages (to page 47 inclusive), there are presented the twelve designs chosen by the Jury for each of which an award of $100 was made.

Incorporated in this group of designs are many suggestions of great practical value from which may be derived ideas suitable for direct application to present-day problems. There are other meritorious suggestions which look far into the future. In the critical notes at the back of this book will be found comments upon the various features of these plans.

Honorable mentions were awarded to the following individuals and groups whose names are alphabetically arranged, there being no distinctions made by the Jury in granting these awards; nor is any relative merit implied by their order of appearance.

Joint award to William Frank Bower, Jr., East Orange, New Jersey; Henry Louis Sandlass, New York, and Alfred A. Rothmann, Brooklyn, New York. These men are all graduates in architecture from the University of Pennsylvania and are engaged in architectural work in New York.

H. Roy Kelley, Architect, Los Angeles, California. Mr. Kelley is a graduate of Cornell University and has studied in Paris. He is active in numerous architectural and art associations in the West and has won prizes in many outstanding design competitions.

Joint award to James S. Nussear, Jr., Architect and William N. S. Pugh, Associate, of Baltimore, Maryland. Mr. Nussear is a practicing architect of more than twenty years' experience with whom Mr. Pugh is associated.

Edward C. Remson, architectural designer in the office of Fellheimer & Wagner, New York, where he has been engaged on the work done by this office as consulting architects for the Curtiss Airports Corporation and the New York Air Terminals, Inc.

George A. Robbins, Architect, of Philadelphia, Pa. Mr. Robbins received his training in the architectural schools of Princeton University and the University of Pennsylvania, and at the office of Paul Phillippe Cret prior to establishing his own office.

Robert Paul Schweikher, Architect, Denver, Colorado; studied at Colorado University, at the Art Institute of Chicago, and is a graduate of the Yale School of Fine Arts.

Fred E. Sloan and Elmer A. Johnson of the firm of Sloan & Johnson, architects, Chicago, Illinois. They are both graduates of the Armour Institute of Technology. Their practice has included the design of a local aviation country club.

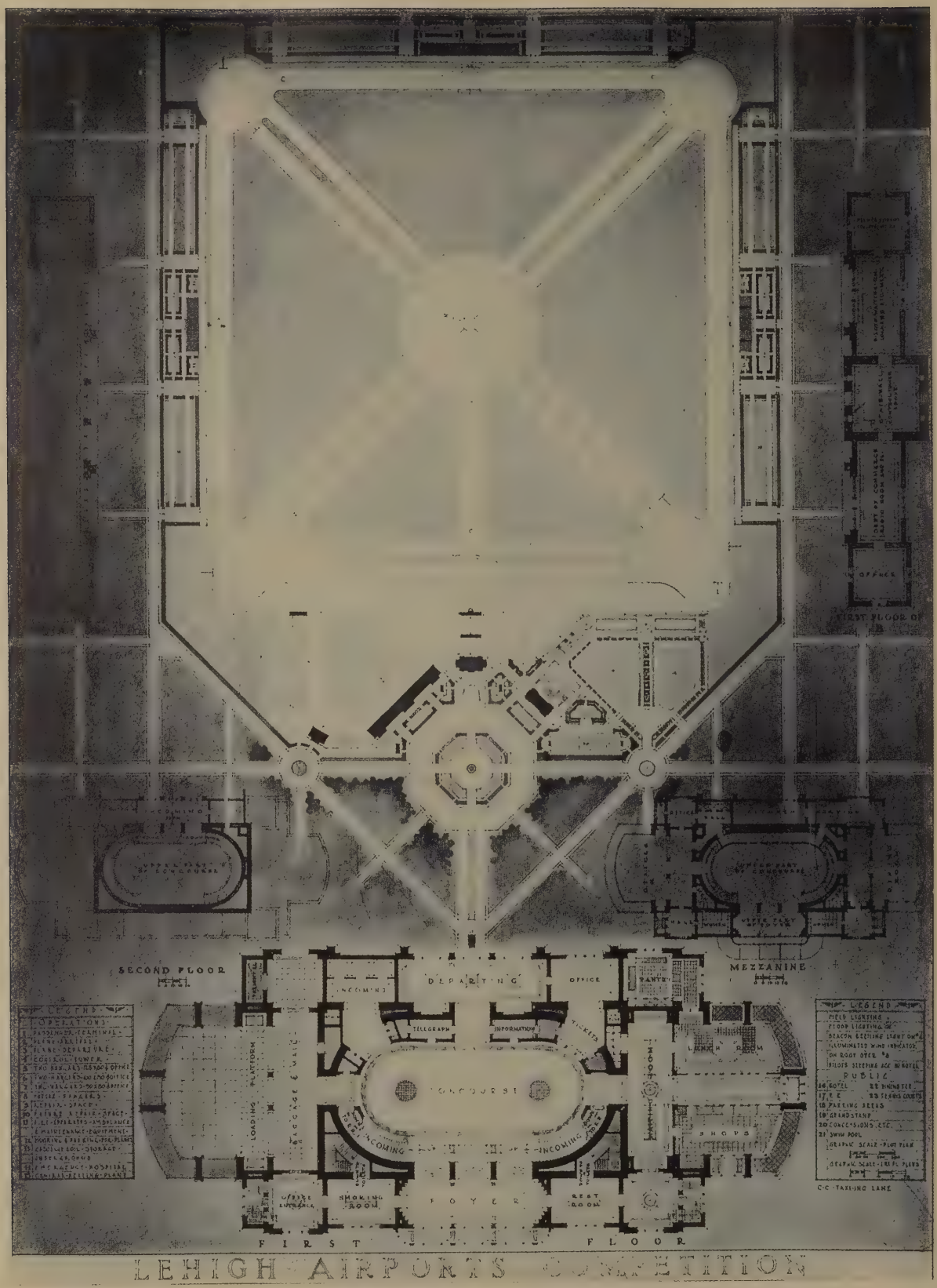
Lloyd N. F. Spicer, Bayside, Long Island, received training at the Boston Architectural Club and at the offices of leading Boston and New York firms.

Edwin M. Stitt, Pittsburgh, Pa., Architectural Student and Draftsman. Senior in the Department of Architecture of the Carnegie Institute of Technology. Studied airport design while working with The Austin Company of Cleveland.

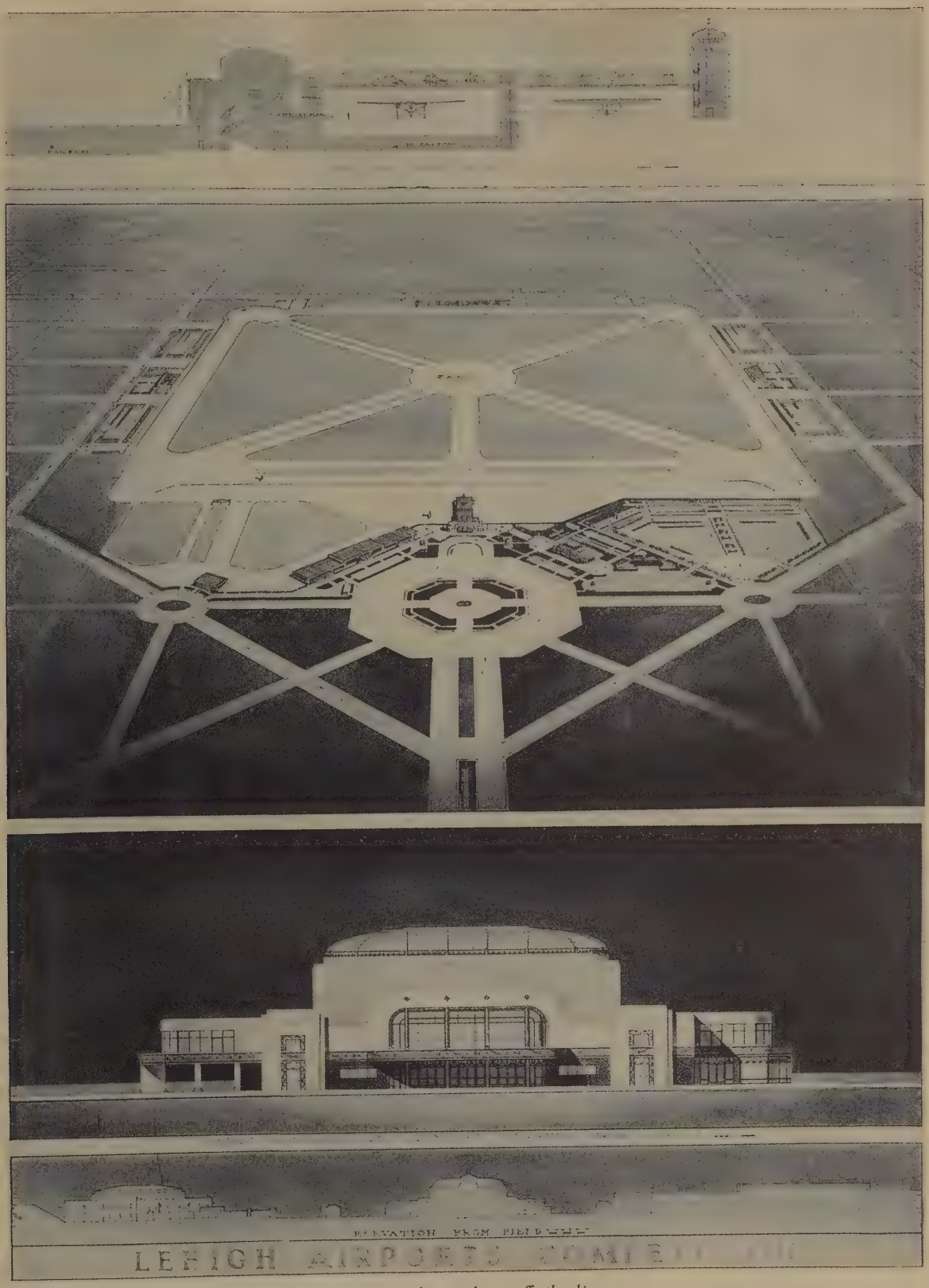
Joint award to Charles A. Stone and U. Floyd Rible, both of the offices of John C. Austin and Frederick M. Ashley, Architects, Los Angeles, California.

Joint award to Robert Doulton Stott, Howard R. Hutchinson and Lansing C. Holden, Jr., of the firm of Holden, Stott and Hutchinson, Associated Architects, New York. The firm has designed the Washington Airport for Western Air Terminals. Mr. Holden, during the war, was an ace credited with seven official victories and several military honors, and is associated with several airport projects.

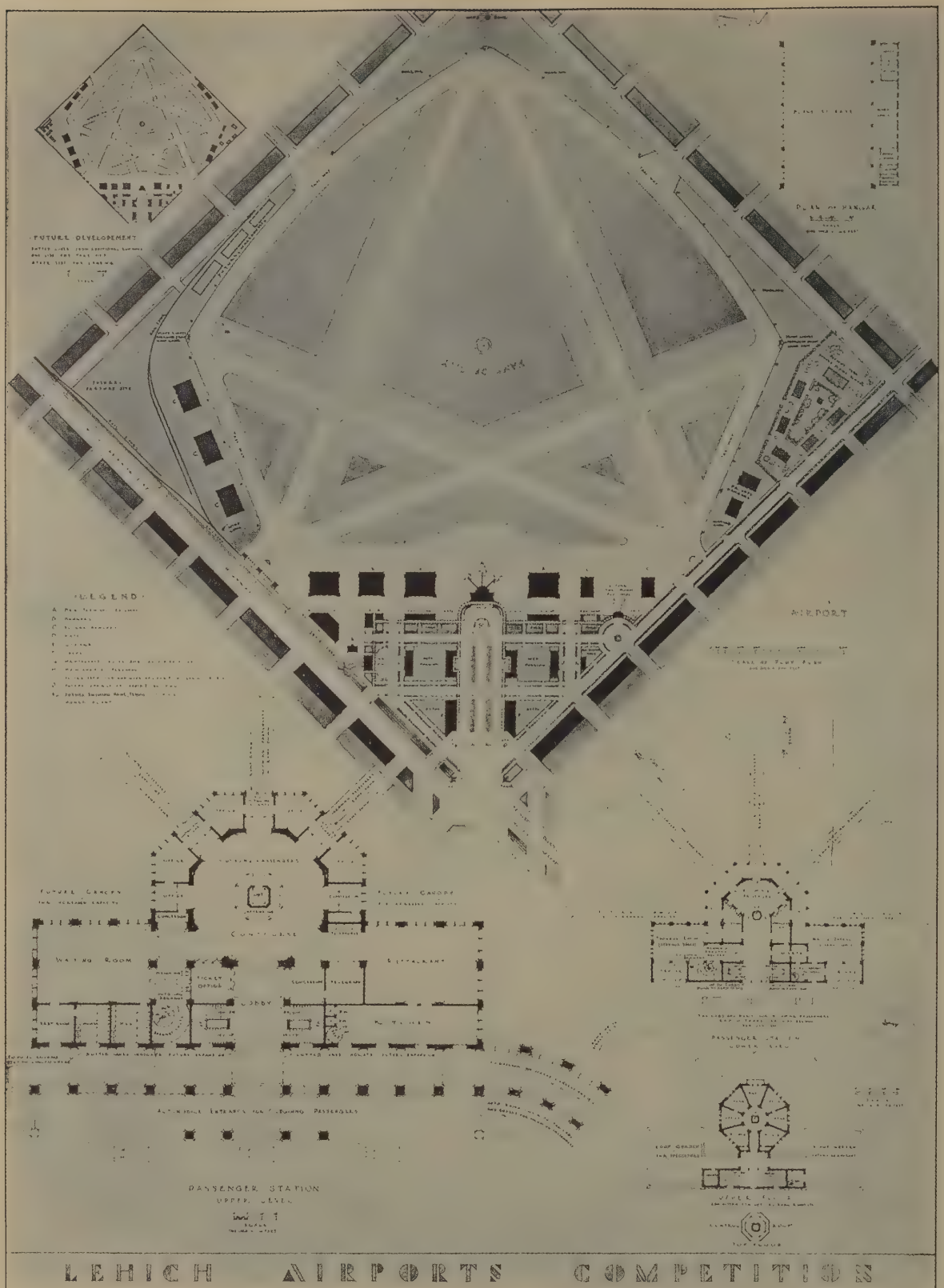
Virgil Westbrook, Architect, San Clemente, California. Lieut. Westbrook was an aviator during the war and is a licensed transport pilot. He was architect for the Air Reserve Base, Long Beach, California.



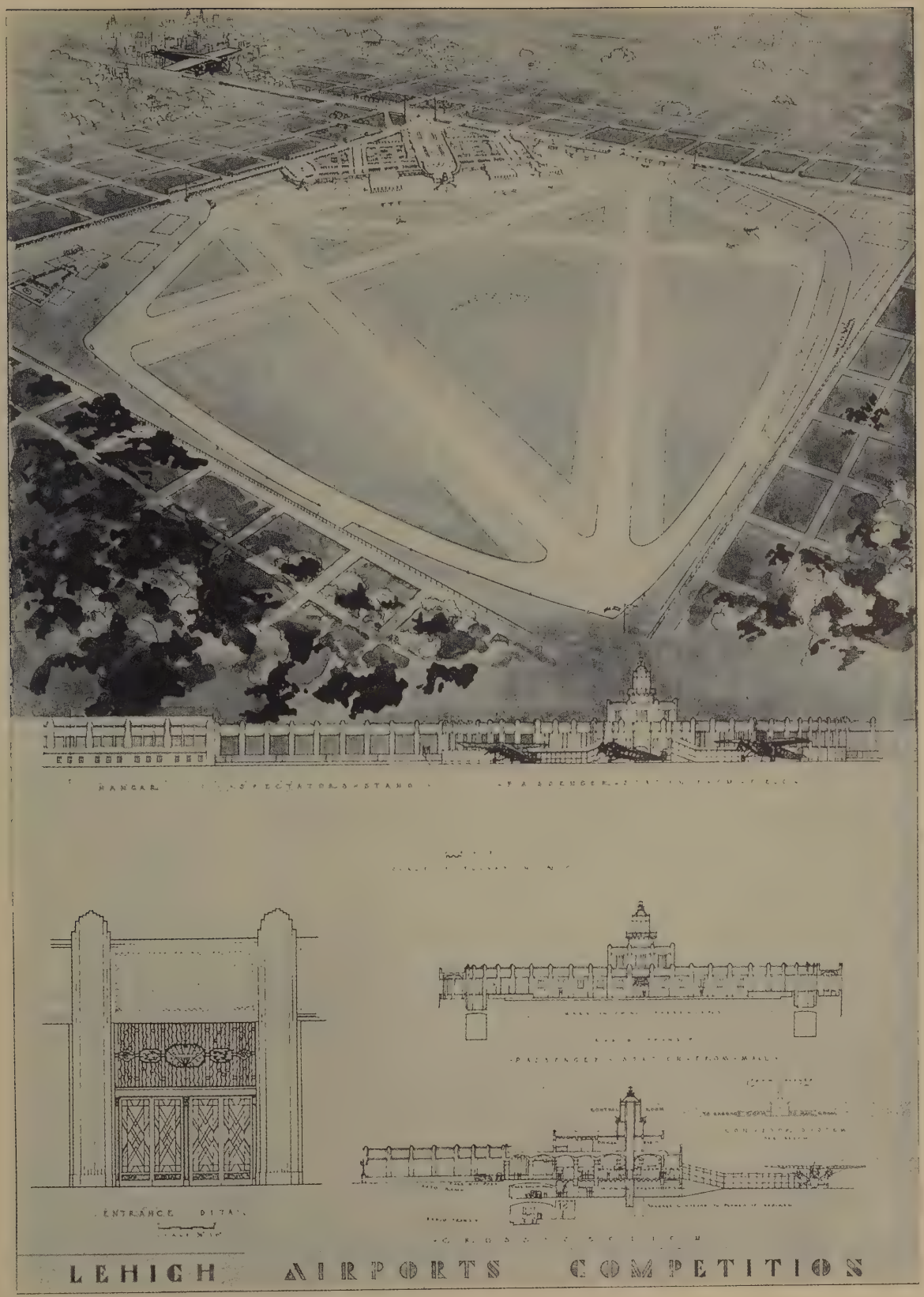
Honorable Mention. Designed by William Frank Bower, Jr., East Orange, N. J.; Henry Louis Sandlass, New York; and Alfred A. Rothmann, Brooklyn, N. Y.



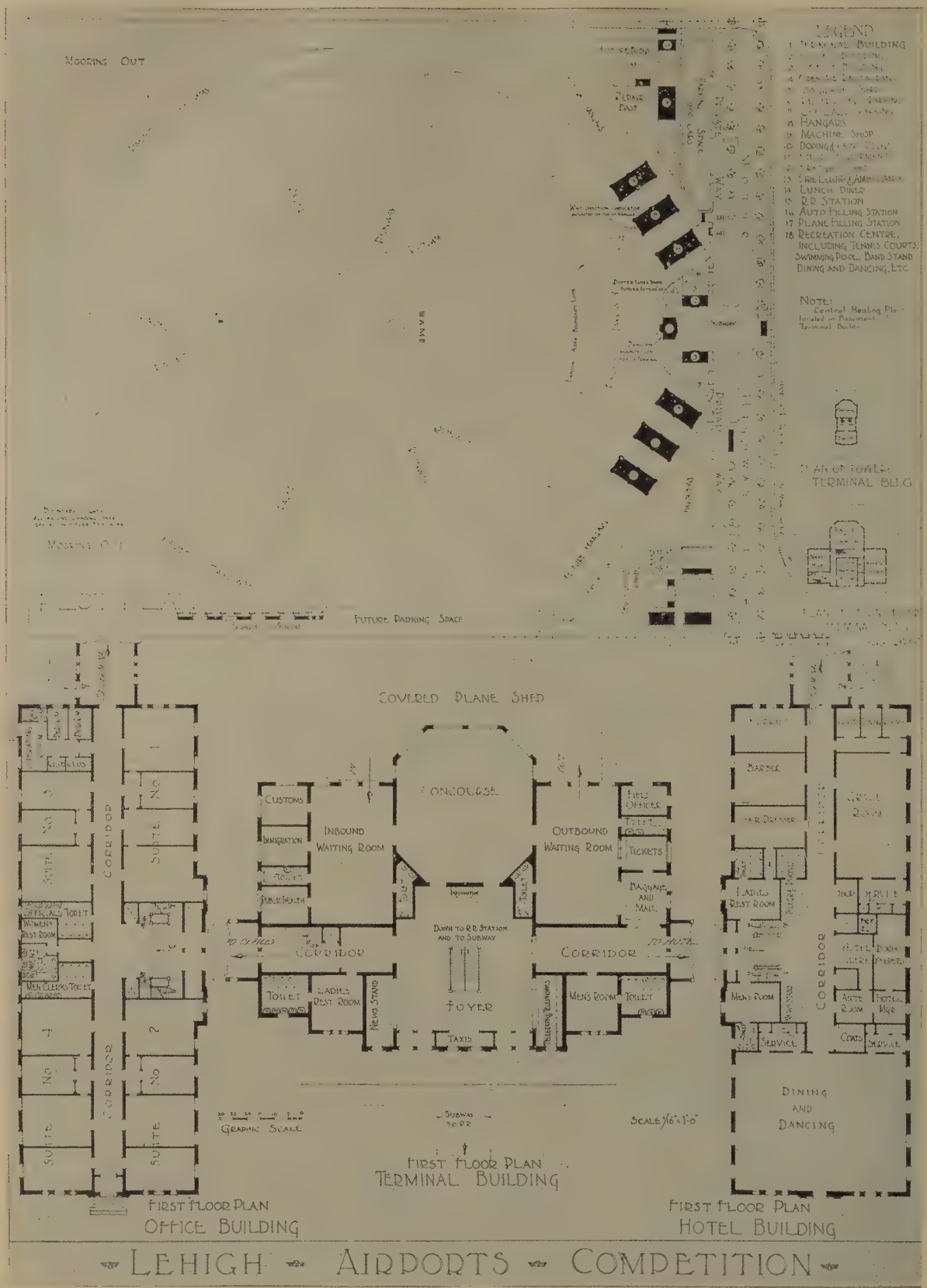
All buildings and other spaces occupied by people are kept off the lines of flight, and public spaces are separated from airport operating areas



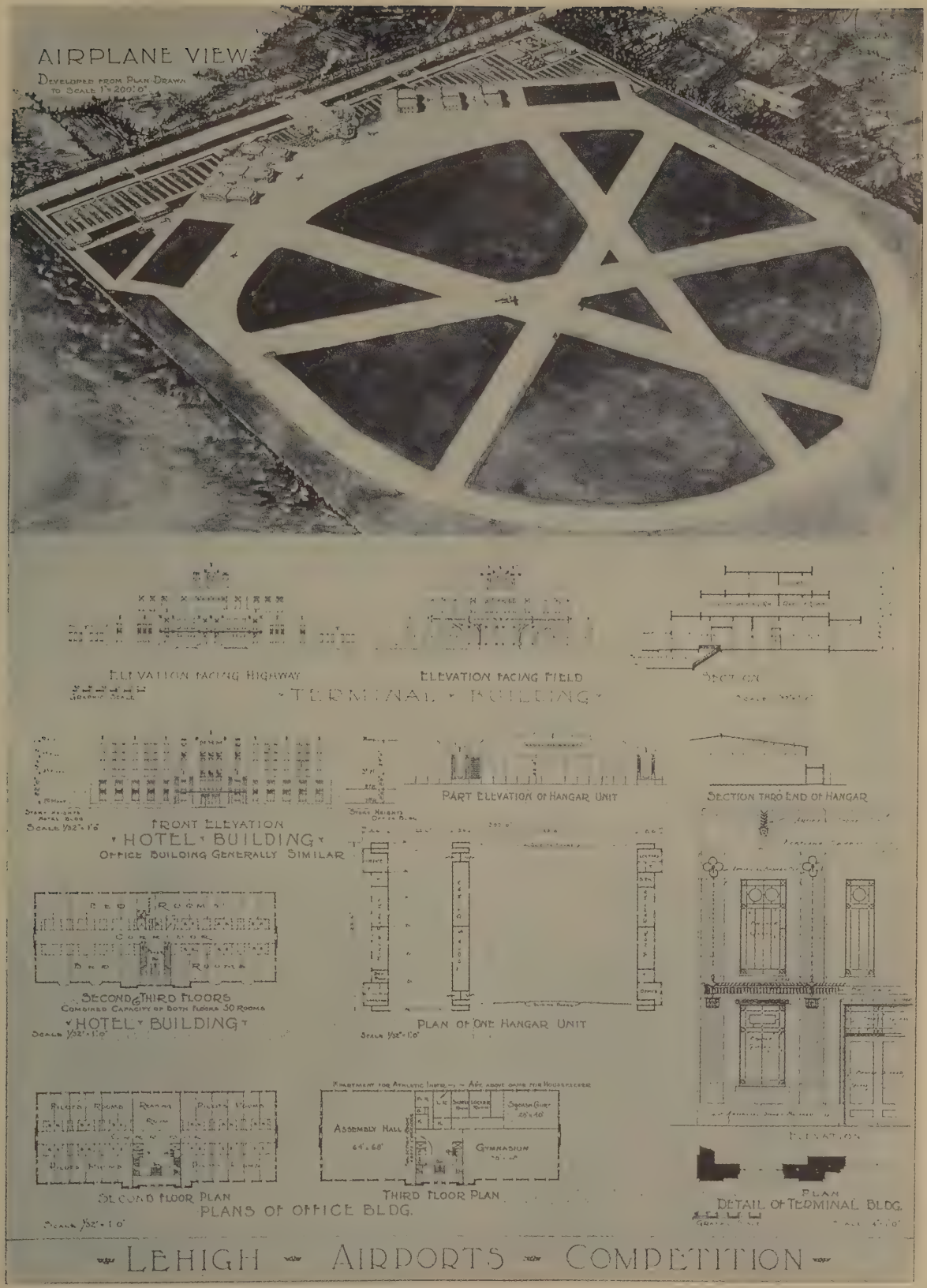
Honorable Mention. Designed by H. Roy Kelley, Architect, of Los Angeles, California



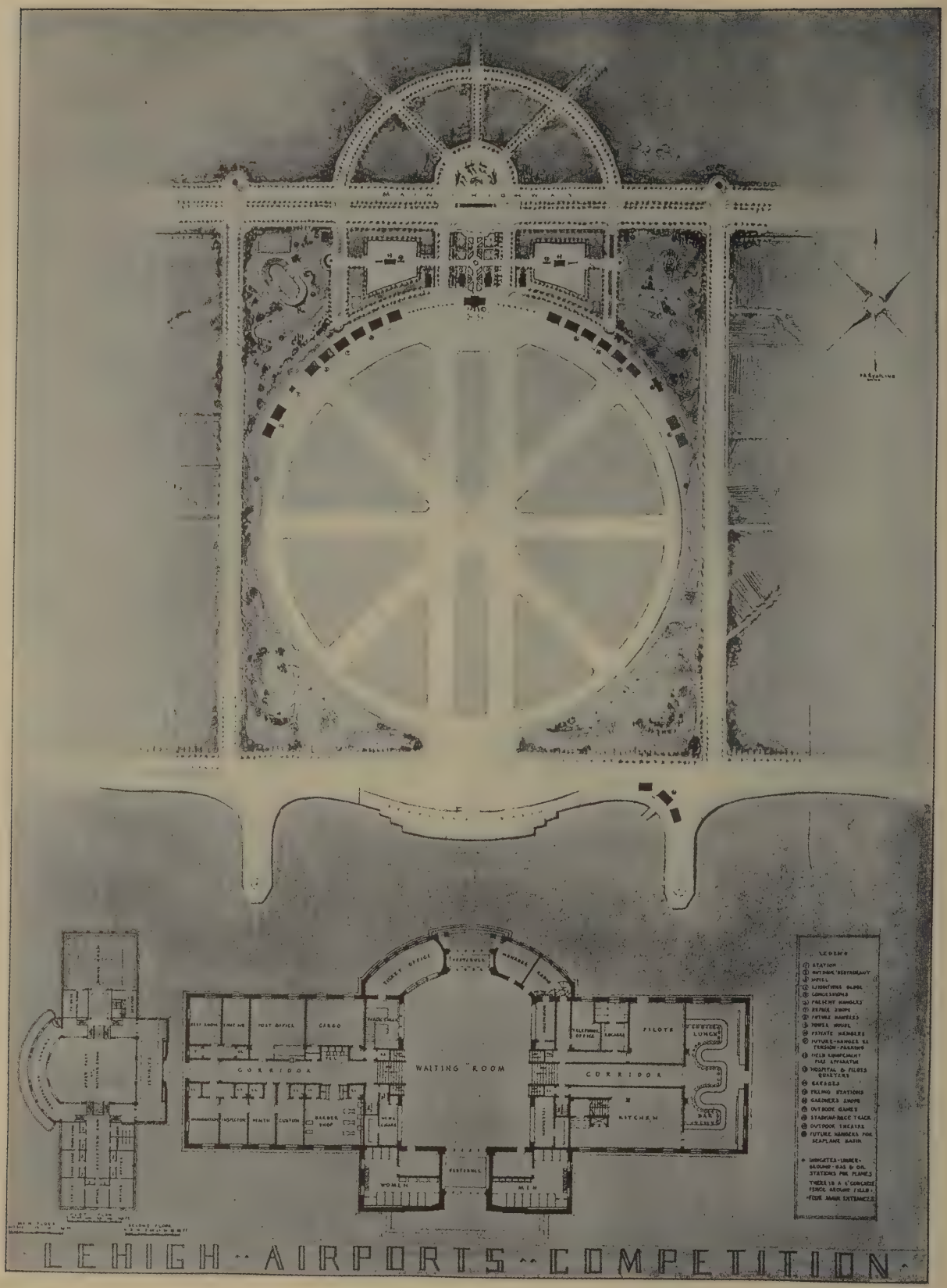
Note the retractable canopies for passengers and the plan for doubling the runway capacity



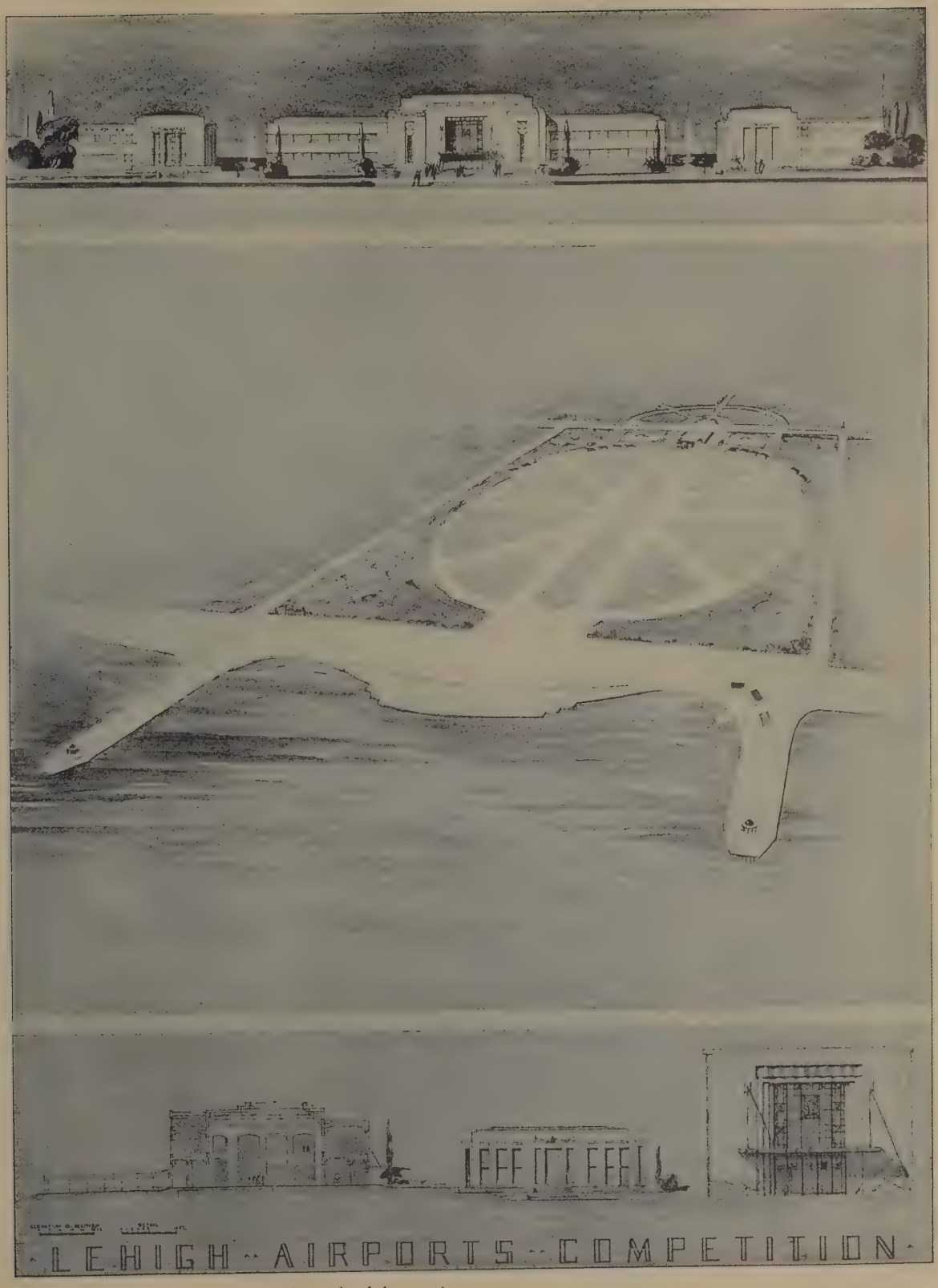
Honorable Mention. Designed by James S. Nussear, Jr., Architect, and William N. S. Pugh, Associate, Baltimore, Maryland.



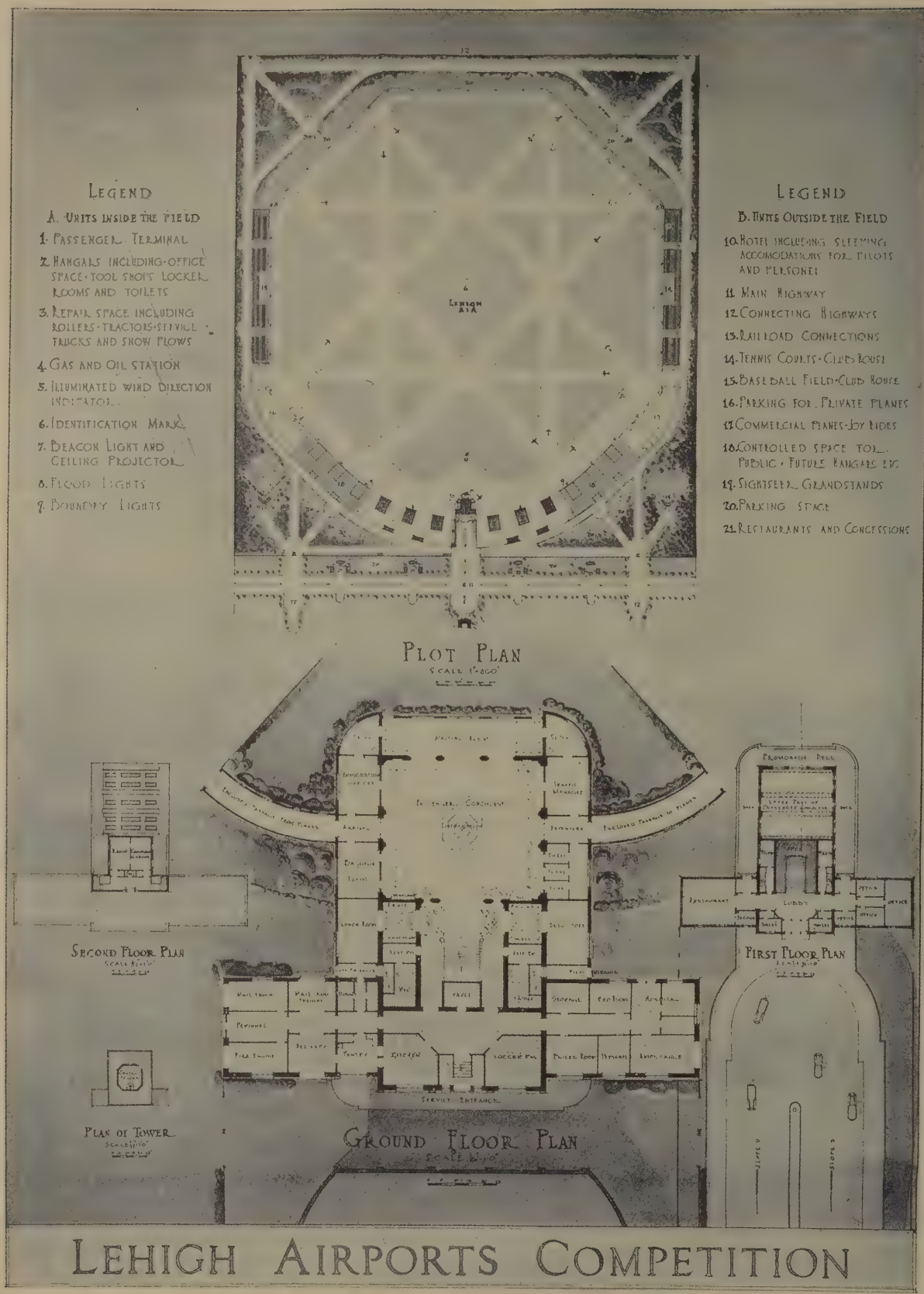
Ample hangar facilities, adequate parking spaces for automobiles, and segregation of incoming and departing passengers are featured



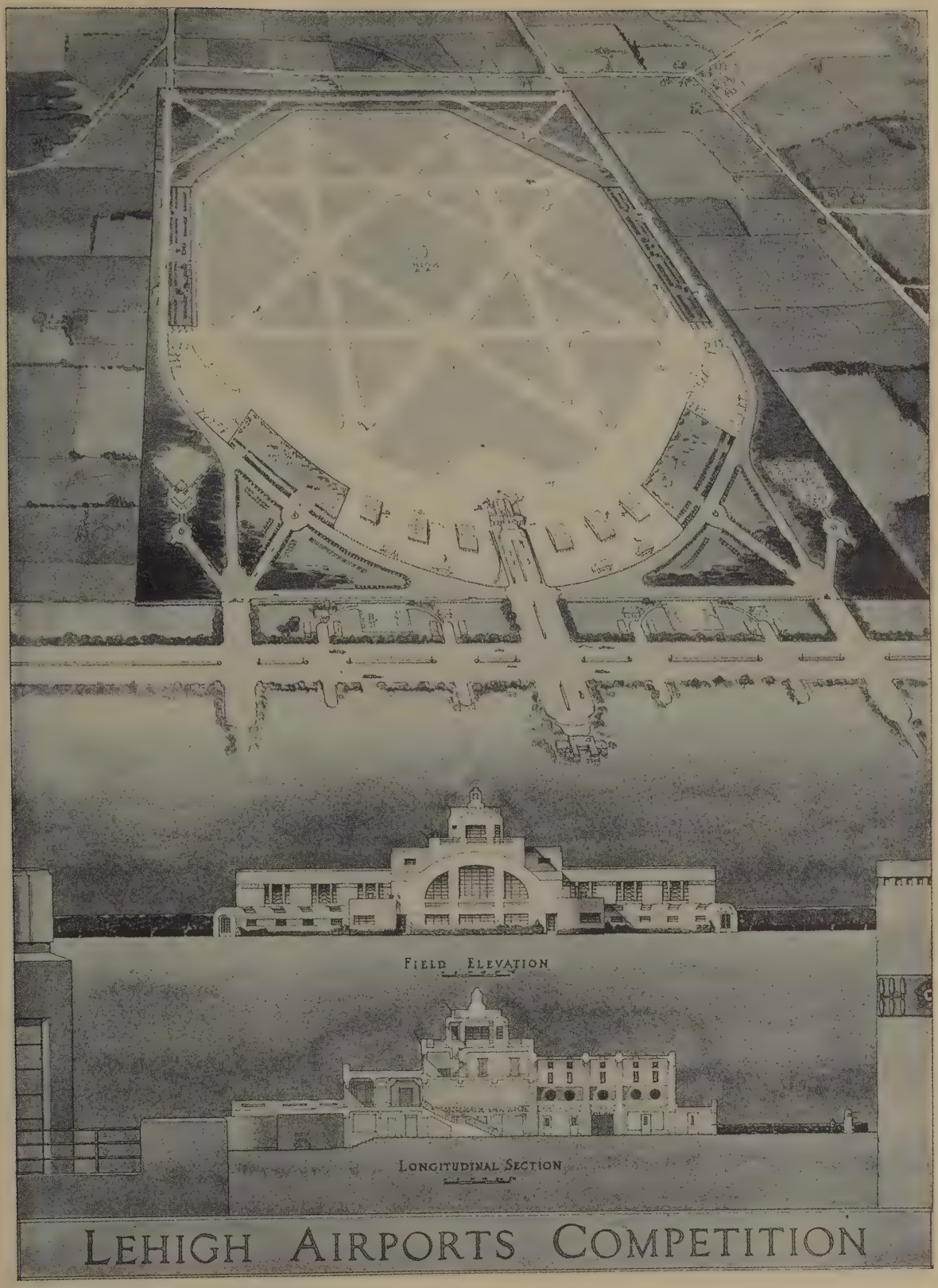
Honorable Mention. Awarded to Edward C. Remson, of the office of Fellheimer and Wagner, Architects, New York



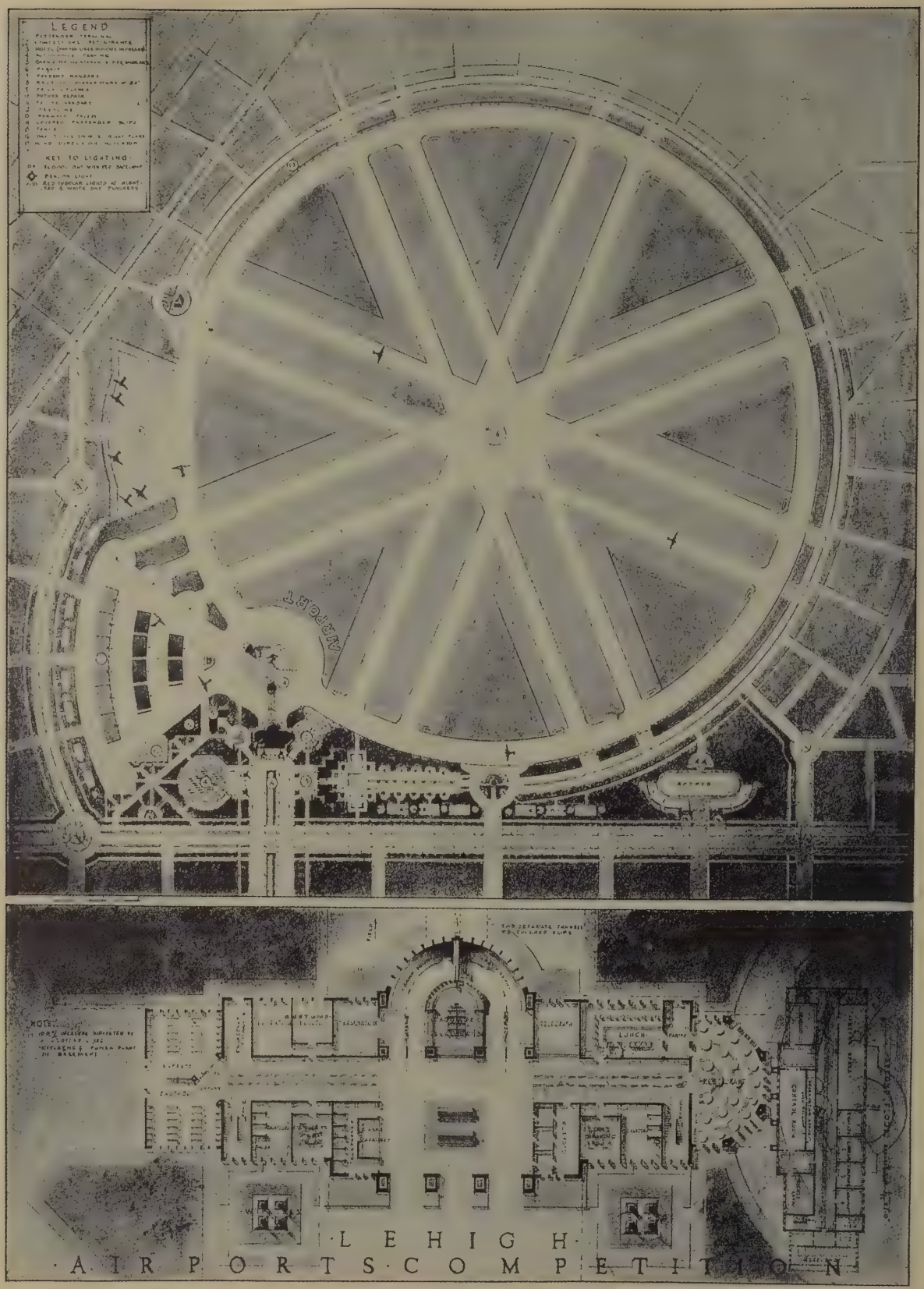
Broad observation terraces flank either side of the terminal building. The seaplane base is a secondary feature


LEGEND
A. UNITS INSIDE THE FIELD
1. PASSENGER TERMINAL
2. HANGARS INCLUDING OFFICE SPACE, TOOL SHOPS LOCKER ROOMS AND TOILETS
3. REPAIR SPACE INCLUDING ROLLERS, TRACTORS, SERVICE TRUCKS AND SNOW PLOWS
4. GAS AND OIL STATION
5. ILLUMINATED WIND DIRECTION INDICATOR
6. IDENTIFICATION MARK
7. BEACON LIGHT AND CEILING PROJECTOR
8. FLOOD LIGHTS
9. BOUNDRY LIGHTS
LEGEND
B. UNITS OUTSIDE THE FIELD
10. HOTEL INCLUDING SLEEPING ACCOMODATIONS FOR PILOTS AND PERSONEL
11. MAIN HIGHWAY
12. CONNECTING HIGHWAYS
13. RAILROAD CONNECTIONS
14. TENNIS COURTS, CLUB HOUSE
15. BASEBALL FIELD, CLUB HOUSE
16. PARKING FOR PRIVATE PLANES
17. COMMERCIAL PLANES, JOY RIDES
18. CONTROLLED SPACE FOR PUBLIC, FUTURE HANGARS ETC
19. SIGHTSEER GRANDSTANDS
20. PARKING SPACE
21. RESTAURANTS AND CONCESSIONS
PLOT PLAN
SECOND FLOOR PLAN
FIRST FLOOR PLAN
PLAN OF TOWER
GROUND FLOOR PLAN
LEHIGH AIRPORTS COMPETITION

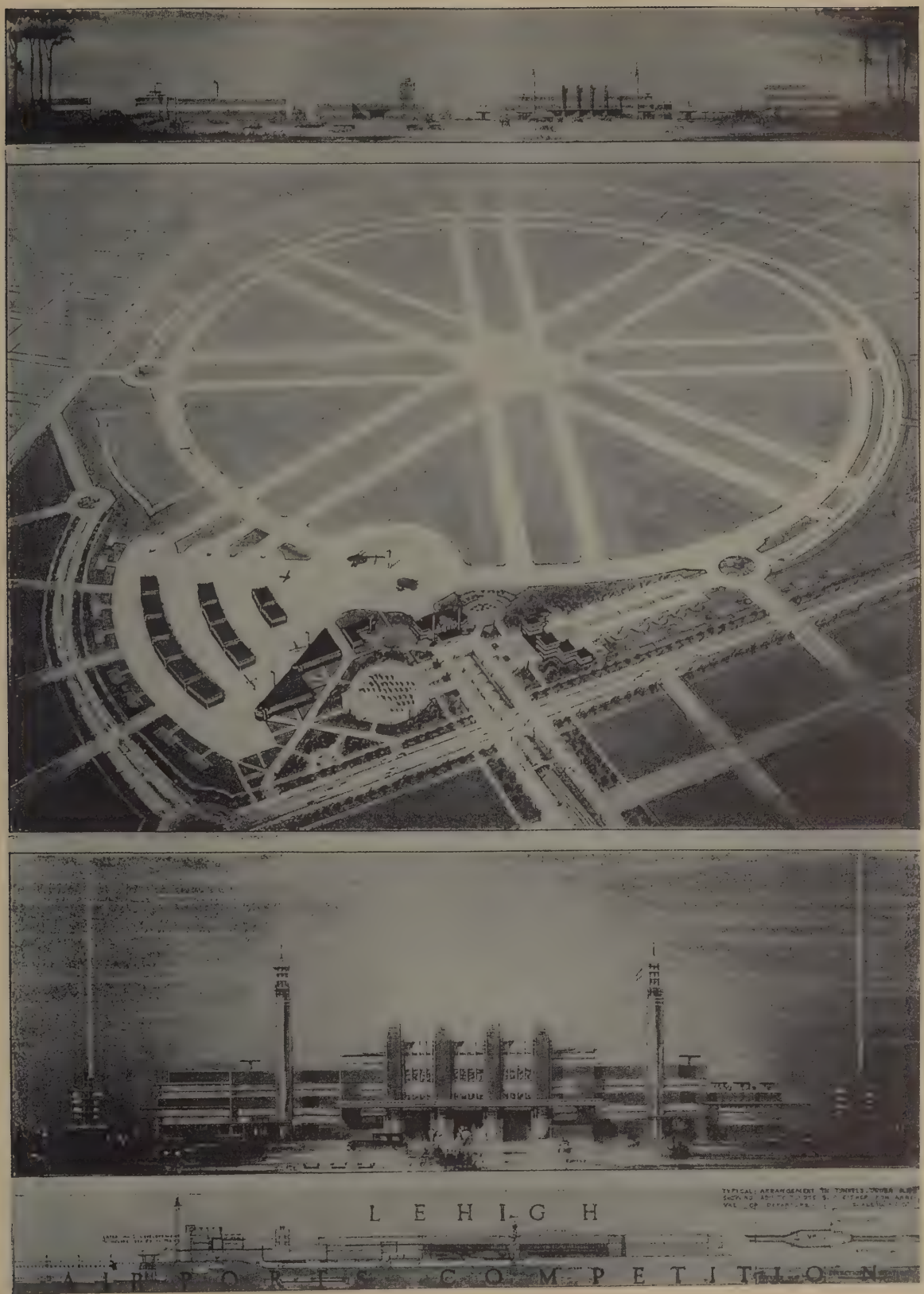
Honorable Mention. Designed by George A. Robbins, Architect, of Philadelphia, Pennsylvania



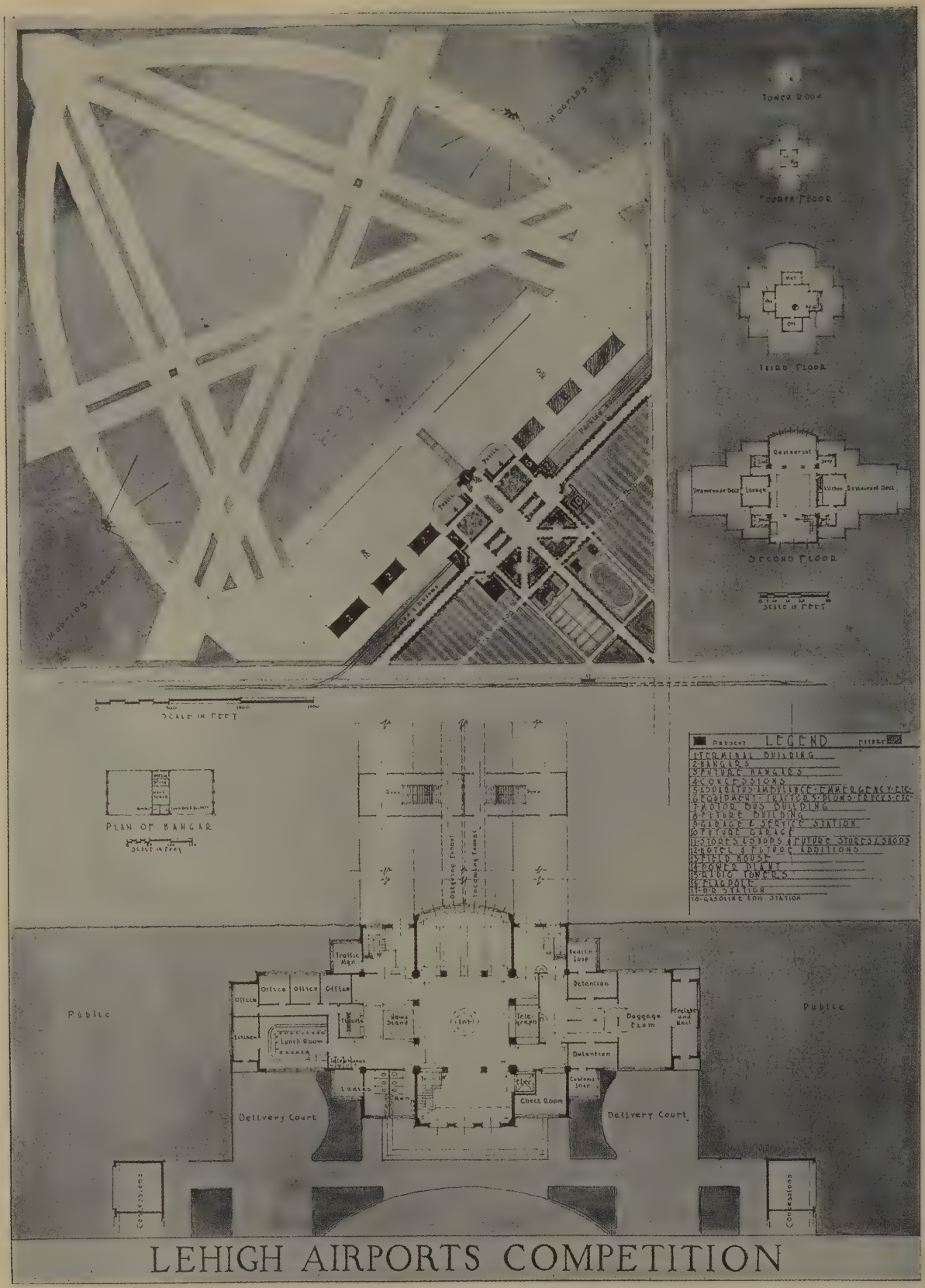
Airplane, automobile and pedestrian traffic have been carefully studied in this plan



Honorable Mention. Designed by Robert Paul Schweikher, Architectural Designer, Denver, Colorado

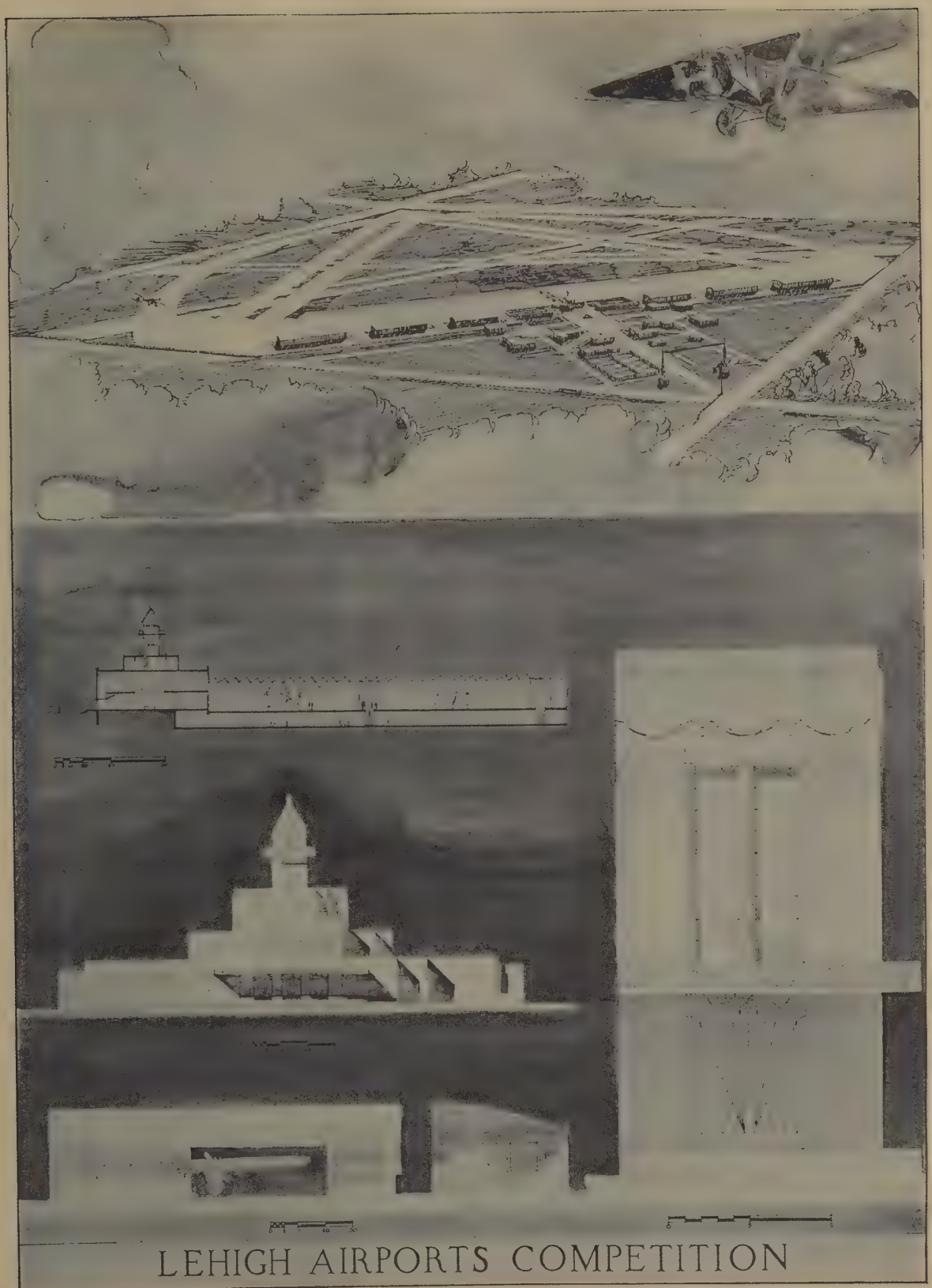


Hangar and repair space completely segregated from public units. Passengers reach planes through tunnel to loading slips

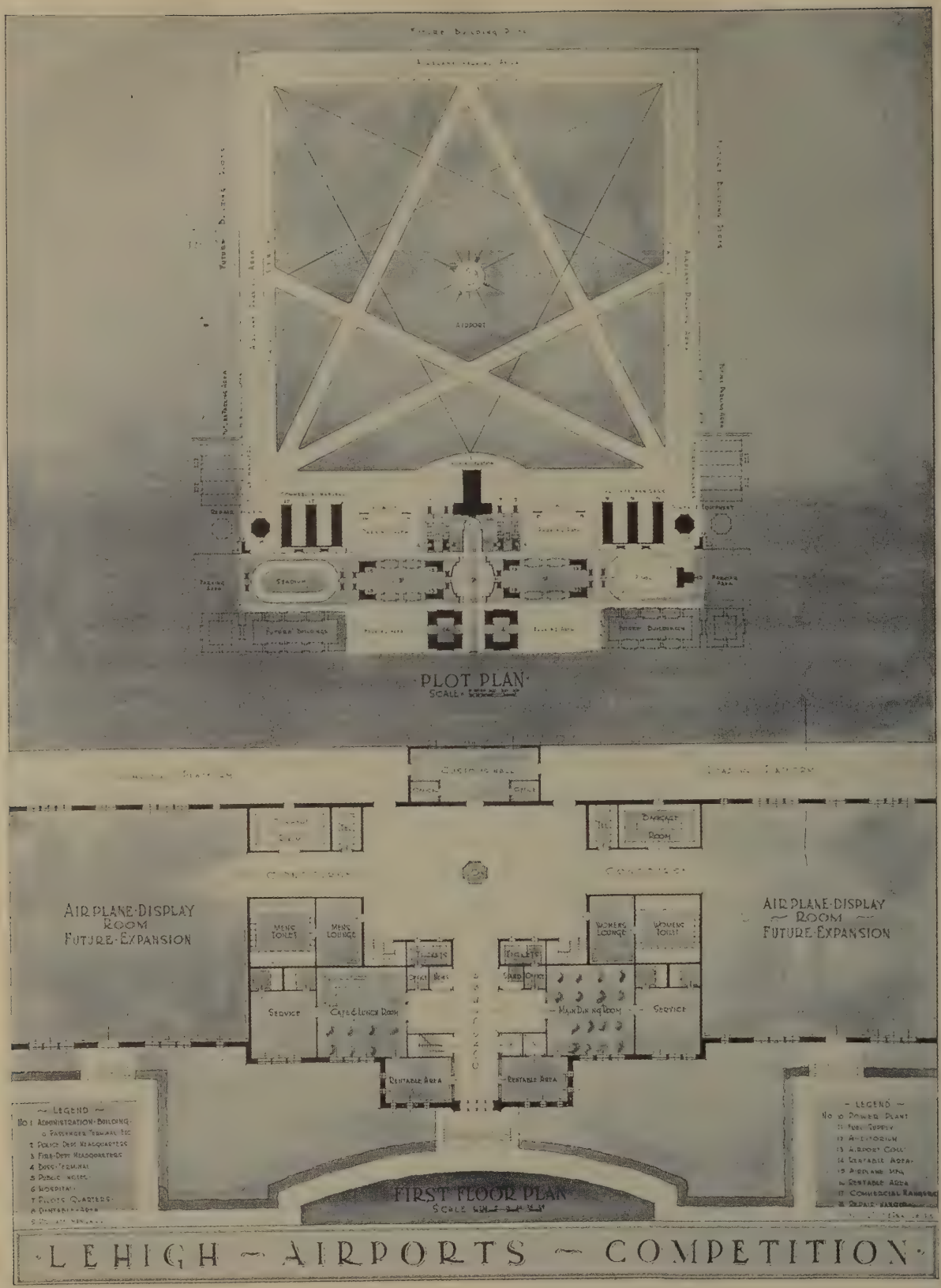


LEHIGH AIRPORTS COMPETITION

Honorable Mention. Designed by Fred E. Sloan and Elmer A. Johnson, of Sloan and Johnson, Architects, Chicago, Illinois

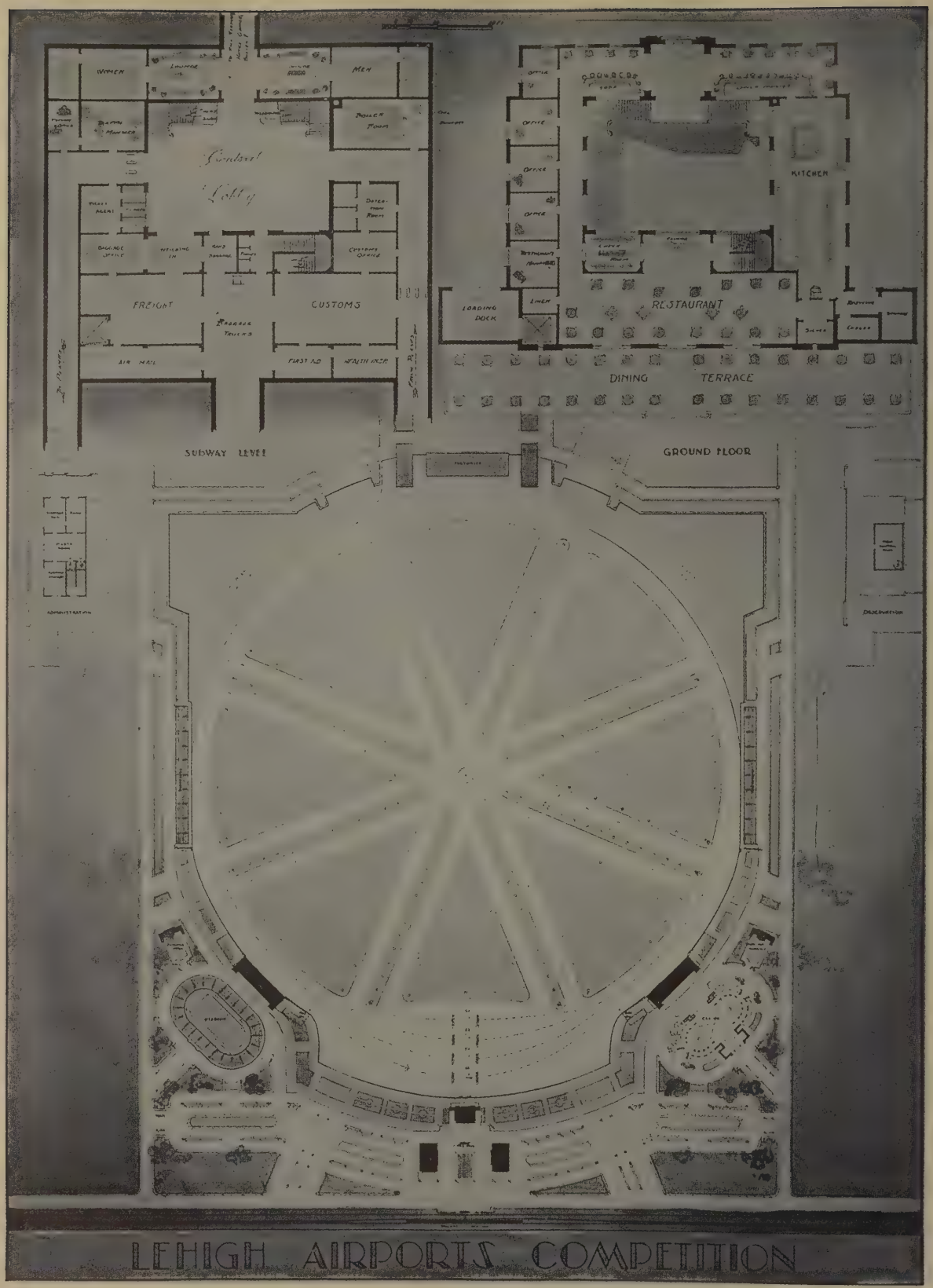


Double runways are here employed in a modified Triarc field plan. Note simple hangar arrangement and generous parking space

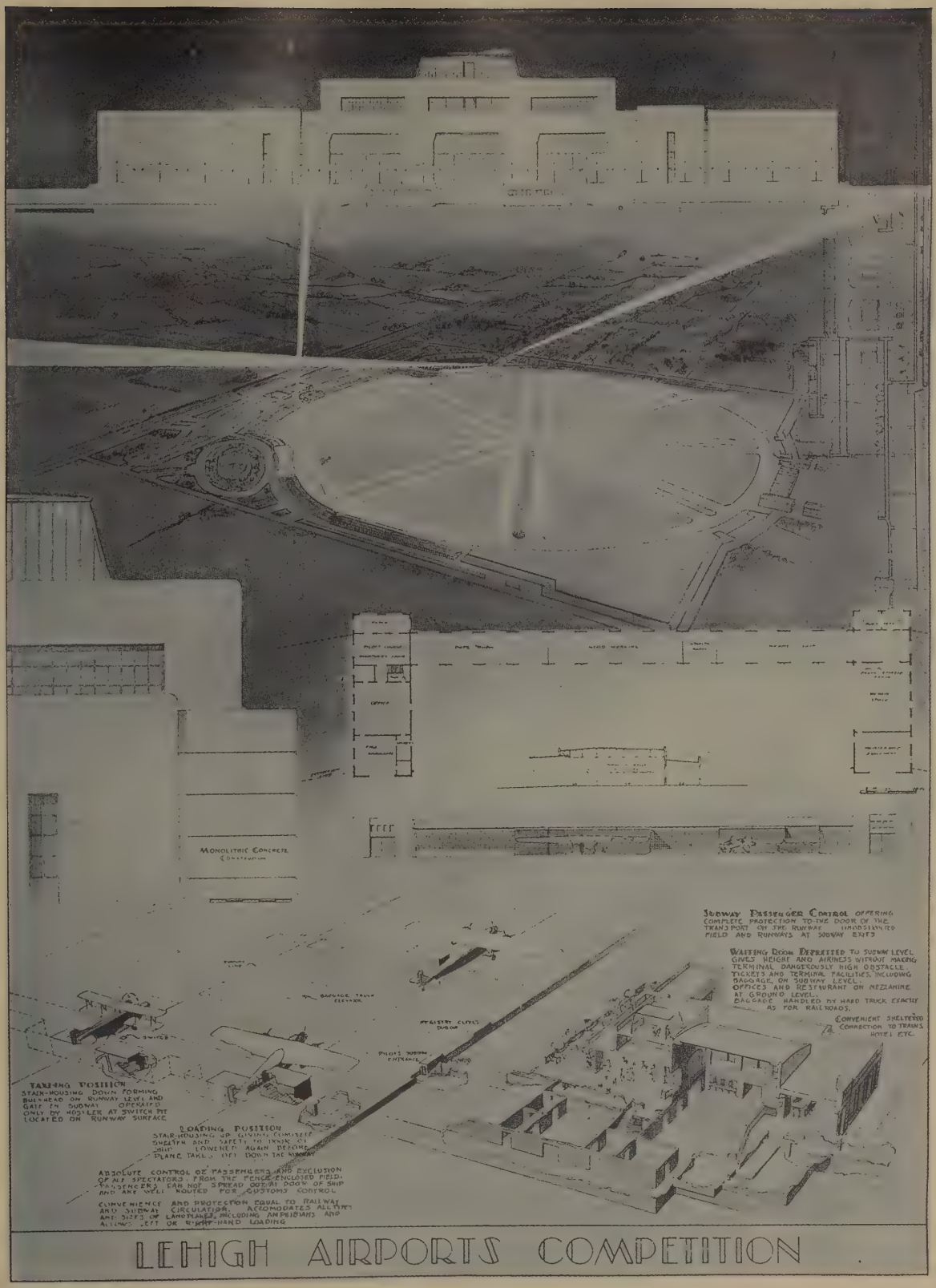


Honorable Mention. Designed by Lloyd N. F. Spicer, Architect, Bayside, Long Island, New York

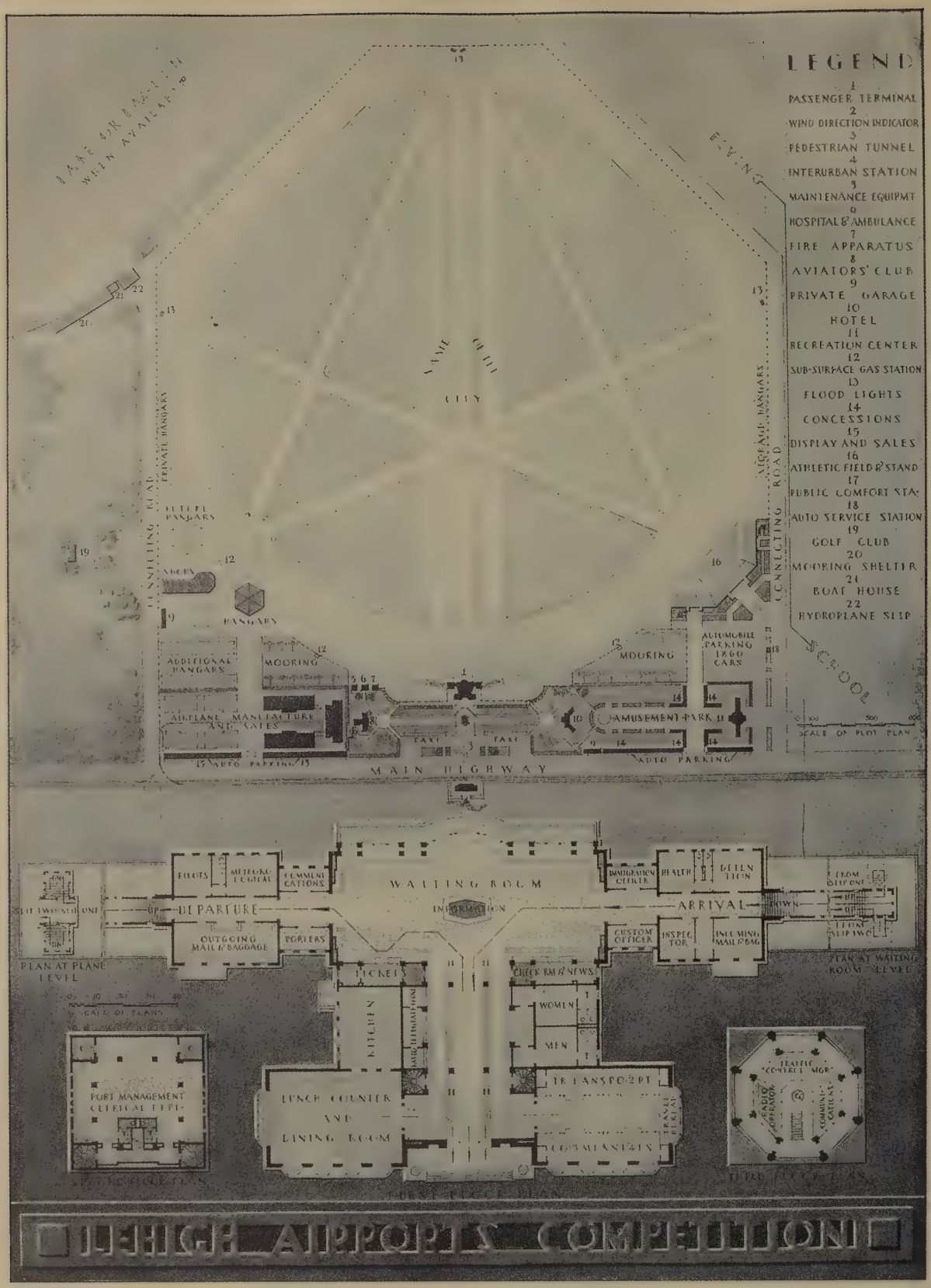
Note method of introducing double runways to double field capacity and placing of parking areas



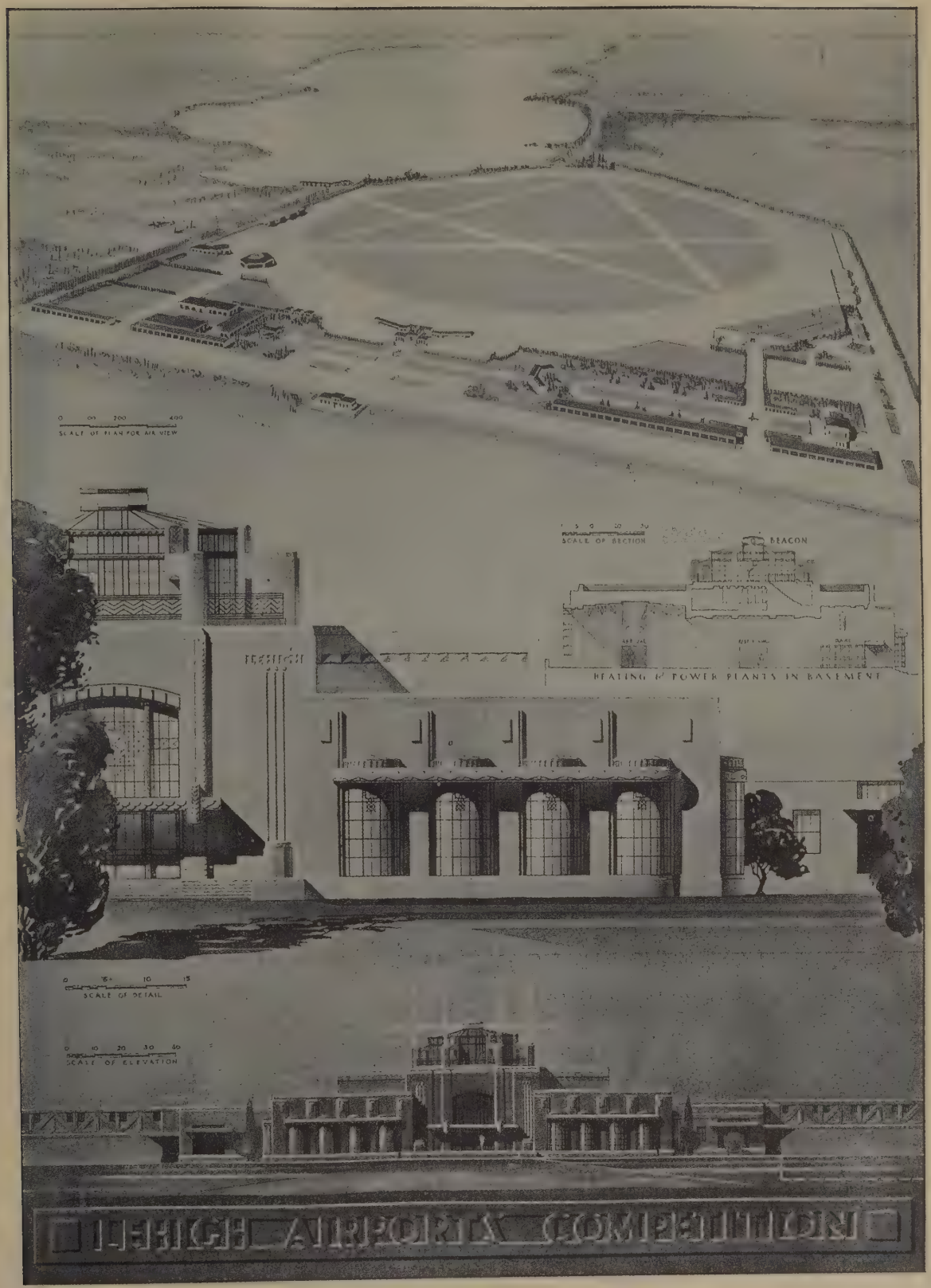
Honorable Mention. Awarded to Edwin M. Stitt, architectural student and designer, Pittsburgh, Pennsylvania


MONOLITHIC CONCRETE CONSTRUCTION
SUBWAY PASSENGER CONTROL OFFERING COMPLETE PROTECTION TO THE DOOR OF THE TRANSPORT ON THE RUNWAY IMMEDIATELY TO FIELD AND RUNWAYS AT SUBWAY EXITS
WAITING ROOM DEPRESSED TO SUBWAY LEVEL GIVES HEIGHT AND AIRINESS WITHOUT MAKING TERMINAL DANGEROUSLY HIGH OBSTACLE. TICKETS AND TERMINAL FACILITIES, INCLUDING BAGGAGE, ON SUBWAY LEVEL. OFFICES AND RESTAURANT ON MEZZANINE. AT GROUND LEVEL. BAGGAGE HANDLED BY HAND TRUCK EXACTLY AS FOR RAILROADS.
CONVENIENT SHELTERED CONNECTION TO TRAINS, HOTEL ETC.
TAXIING POSITION
STAIR-HOUSING DOWN FORMING BULKHEAD ON RUNWAY LEVEL AND GATE IN SUBWAY OPERATED ONLY BY HOSTLER AT SWITCH PIT LOCATED ON RUNWAY SURFACE
LOADING POSITION
STAIR-HOUSING UP GIVING COMPLETE SHELTER AND SAFETY TO PASSENGERS WHO LOITER AGAIN BEFORE PLANE TAKES OFF DOWN THE RUNWAY
ABSOLUTE CONTROL OF PASSENGERS AND EXCLUSION OF ALL SPECTATORS FROM THE FENCE-ENCLOSED FIELD. PASSENGERS CAN NOT SPREAD OUT AT DOOR OF SHIP AND ARE WELL ROUTED FOR CUSTOMS CONTROL
CONVENIENCE AND PROTECTION EQUAL TO RAILWAY AND SUBWAY CIRCULATION. ACCOMODATES ALL TYPES AND SIZES OF LANDPLANES, INCLUDING AMPHIBIANS AND ALLOWS LEFT OR RIGHT-HAND LOADING
LEHIGH AIRPORTS COMPETITION

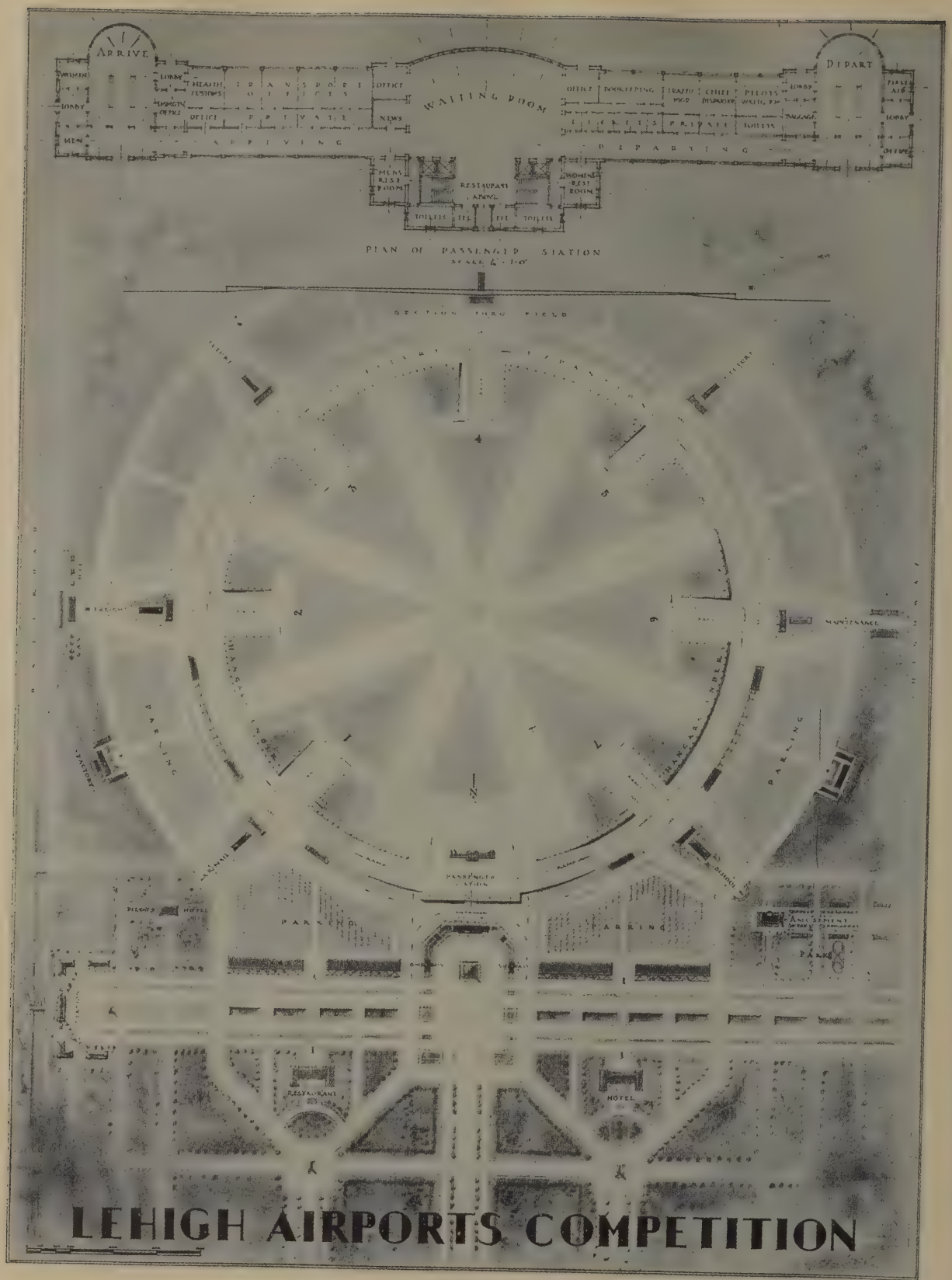
Special interest attaches to the subway passenger control with elevating canopies at loading points. Patents have been applied for by the designer



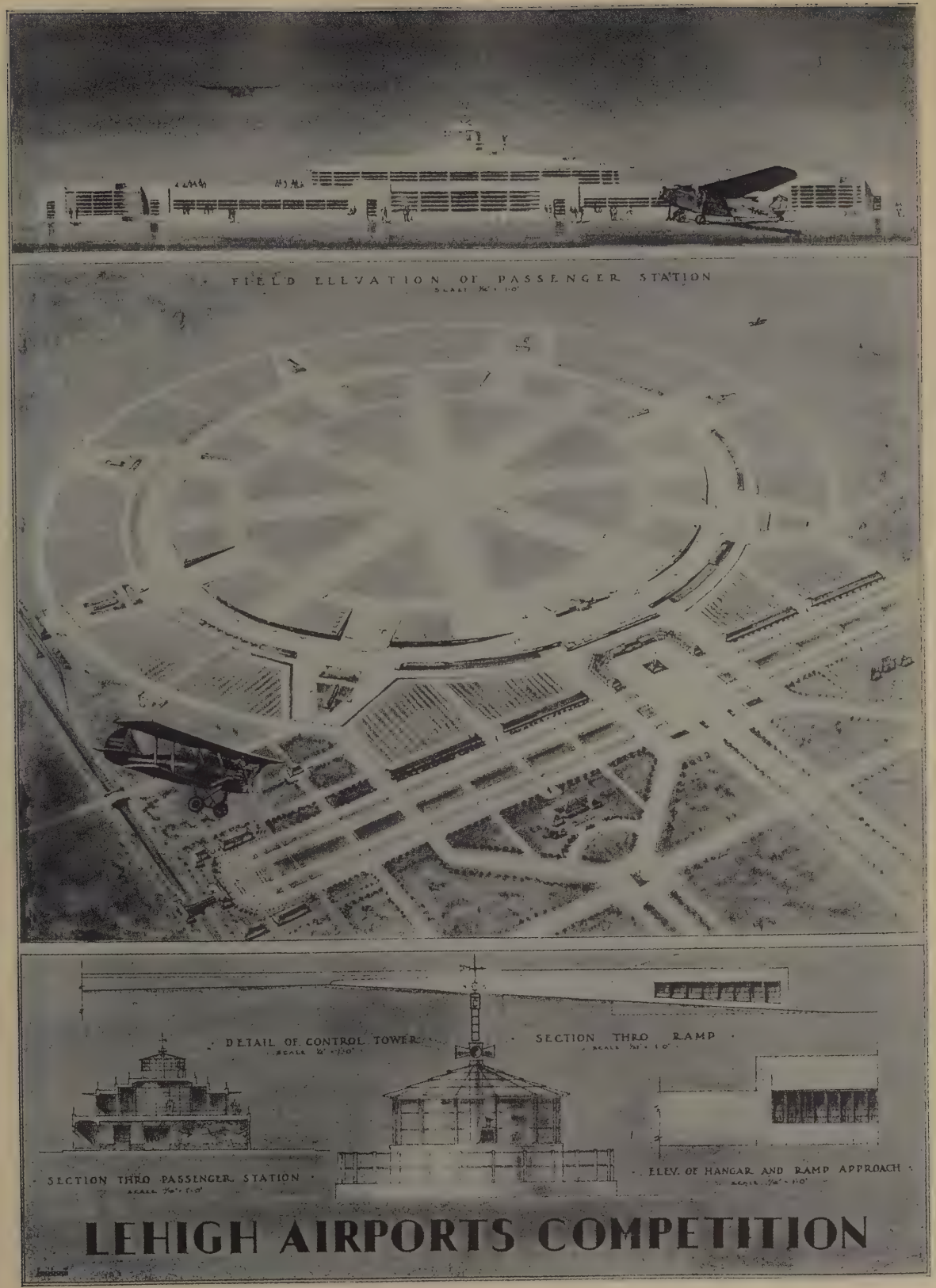
Honorable Mention. Designed by Charles A. Stone and U. Floyd Rible, both of the office of John C. Austin & Frederick M. Ashley, Architects, Los Angeles, California



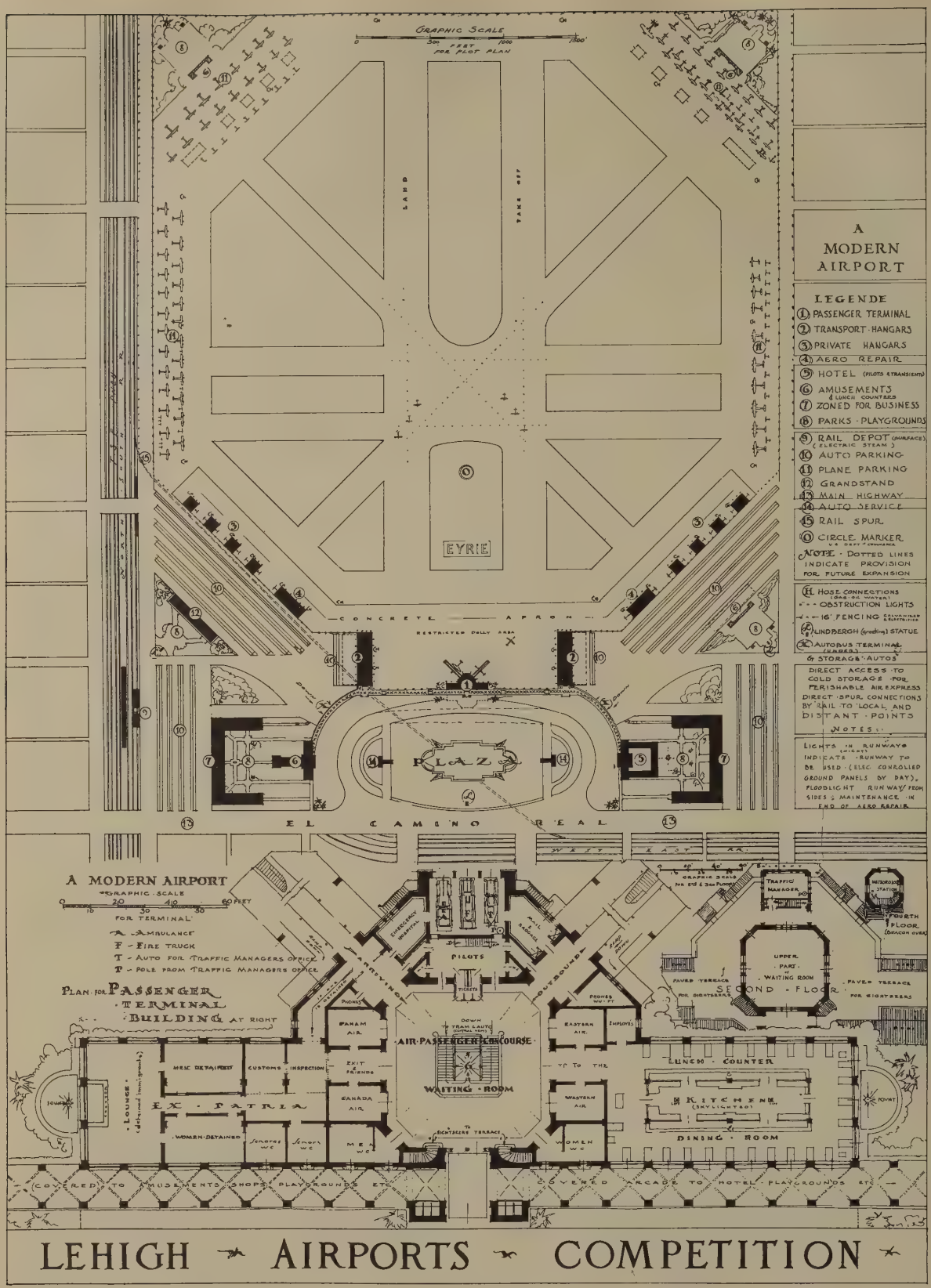
This design incorporates many types of concessions, including recreation parks and airplane manufacturing, from which income may be derived by the airport



Honorable Mention. Designed by Robert Doulton Stott, Howard R. Hutchinson, and Lansing C. Holden, Jr., of Holden, Stott & Hutchinson, Associated Architects, New York

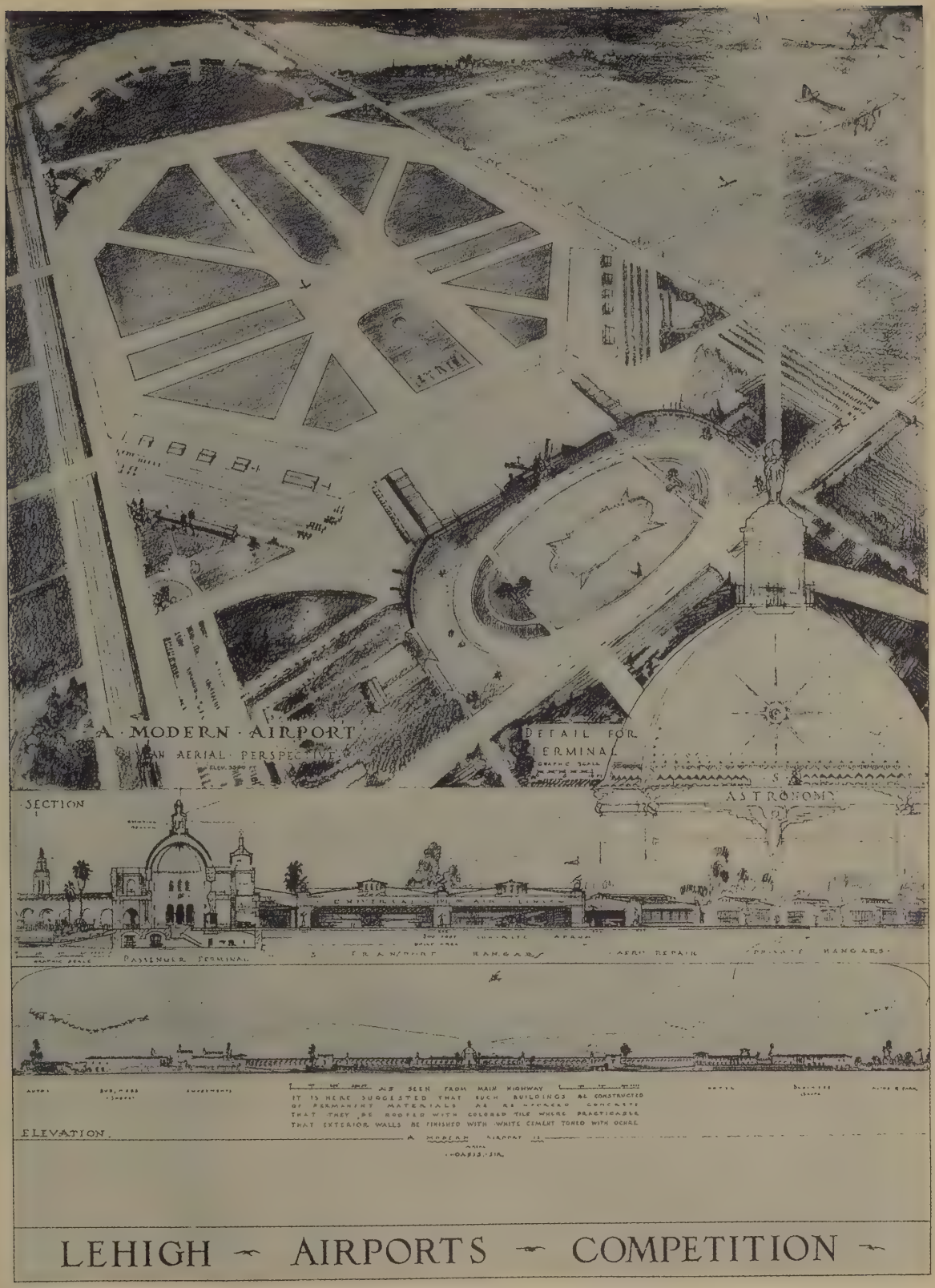

FIELD ELEVATION OF PASSENGER STATION
DETAIL OF CONTROL TOWER
SECTION THRO RAMP
SECTION THRO PASSENGER STATION
ELEV. OF HANGAR AND RAMP APPROACH
LEHIGH AIRPORTS COMPETITION

Hangars, partly underground, are placed around the perimeter of this circular field, with the runways extending over their flat roof surfaces



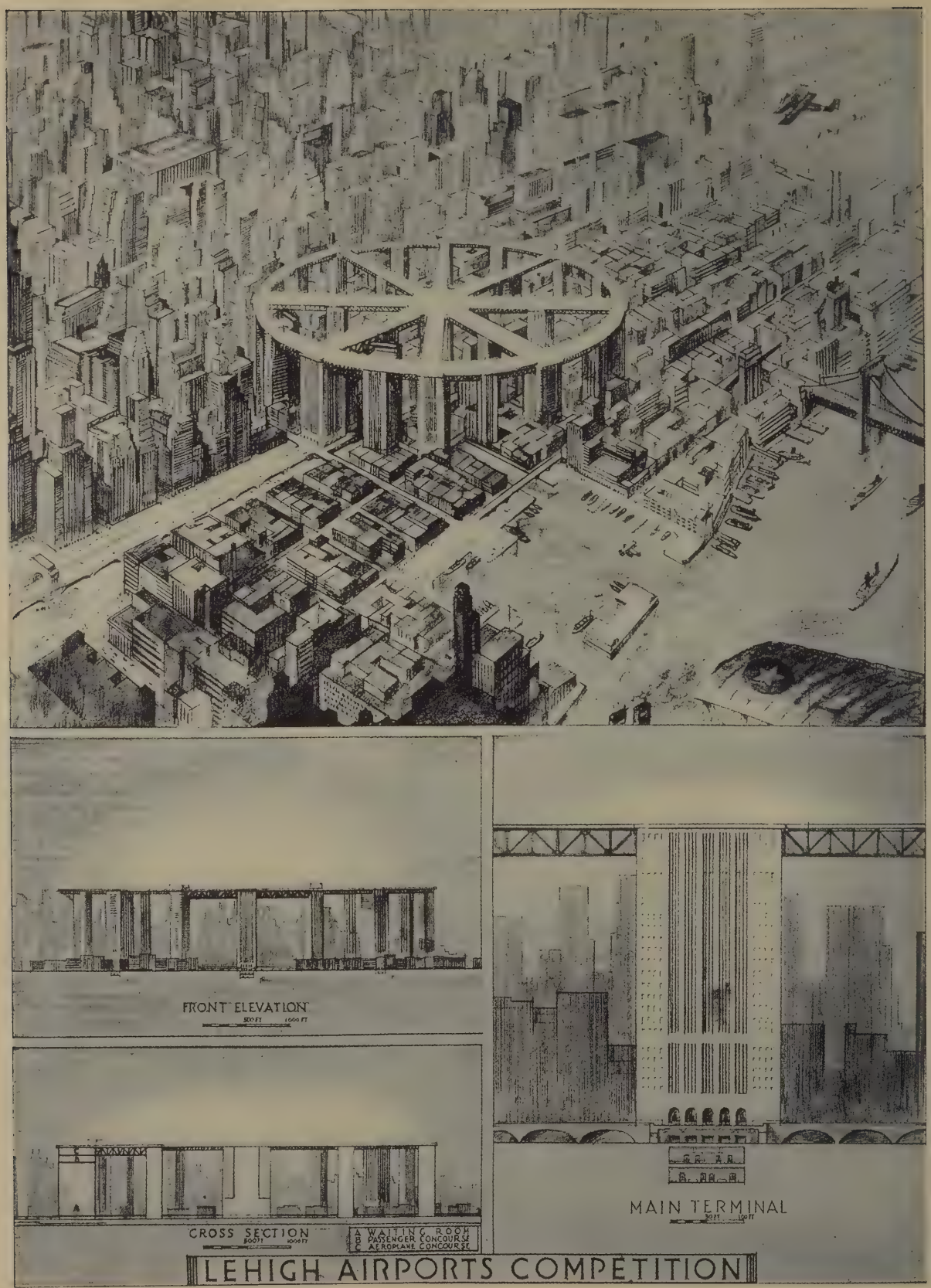
LEHIGH ✈ AIRPORTS ✈ COMPETITION

Honorable Mention. Awarded to Virgil Westbrook, Architect, of San Clemente, Calif.


A · MODERN · AIRPORT
AN AERIAL · PERSPECTIVE
DETAIL FOR TERMINAL
SECTION
ASTRONOMY
PASSENGER TERMINAL
TRANSPORT HANGARS
AERO REPAIR
PRIVATE HANGARS
AS SEEN FROM MAIN HIGHWAY
IT IS HERE SUGGESTED THAT SUCH BUILDINGS BE CONSTRUCTED OF PERMANENT MATERIALS AS REINFORCED CONCRETE THAT THEY BE ROOFED WITH COLORED TILE WHERE PRACTICABLE THAT EXTERIOR WALLS BE FINISHED WITH WHITE CEMENT TONED WITH OCHRE
ELEVATION
A MODERN AIRPORT

LEHIGH — AIRPORTS — COMPETITION

Double runways are provided in two directions of prevailing winds. Parking and plane mooring spaces unusually liberal



Looking far into the future, this design submitted by H. Altvater of New York, suggests a huge wheel resting on the roofs of many skyscrapers

SELECTED DESIGNS

DURING the judgment of the Lehigh Airports Competition, the members of the Jury were deeply impressed by the variety of interesting and ingenious ideas which distinguished a great many of the entries. It was at once apparent that regardless of the merits of those designs which were premiated in the final judgment, many other entries contributed ideas that might well prove of practical value to airport planners and officials. The great variety of conditions under which airports will be developed in the future suggested the value of publishing a considerable number of different plan conceptions.

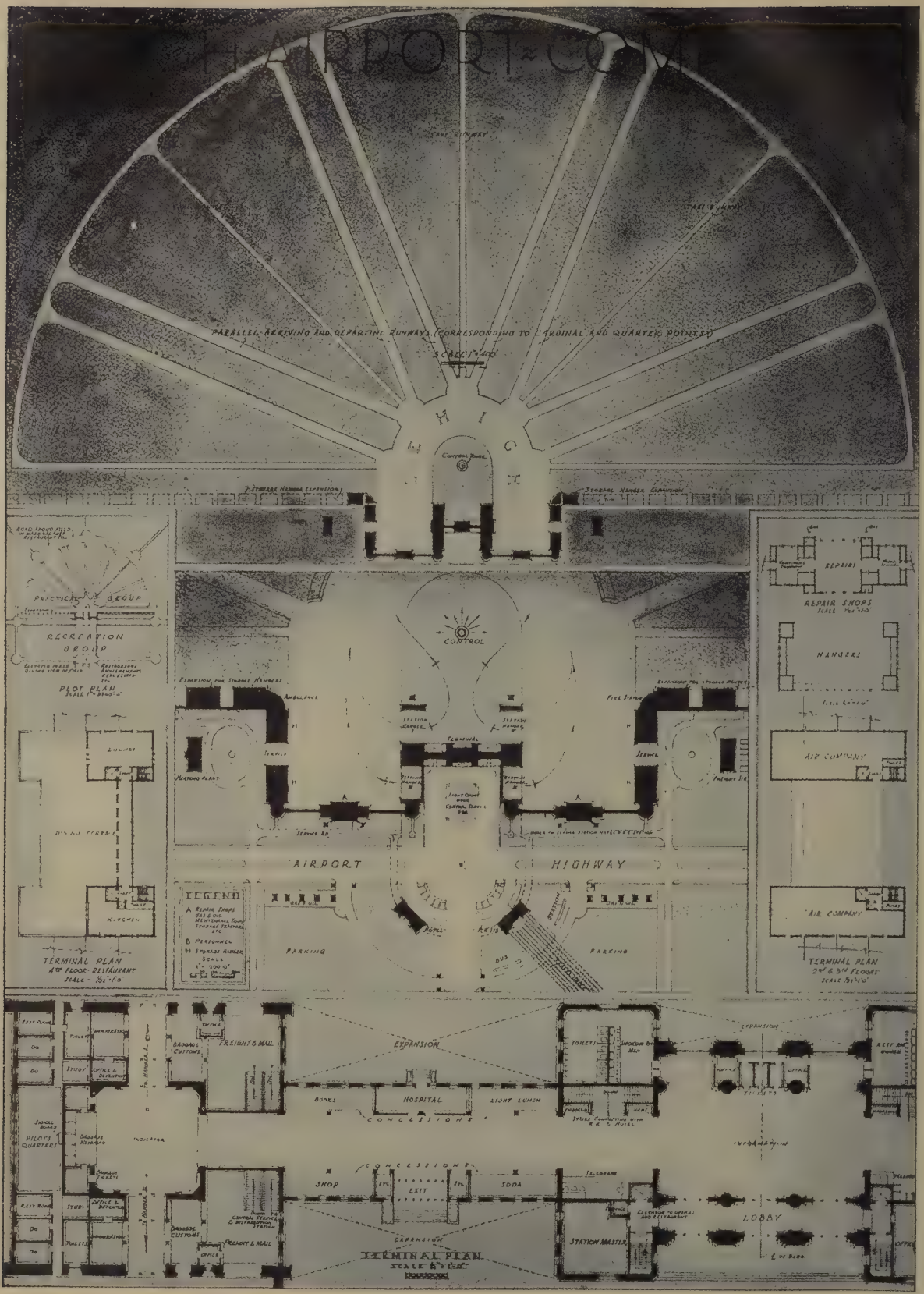
Upon completion of the judgment, the Jury assisted in the selection of those designs which they believed should be reserved for exhibition and publication. The designs presented on the following pages and on the facing page have been selected from the seventy-one entries set aside by the Jury in this manner.

The order of their appearance in these pages has no significance whatever as indicative of their relative merit. In some cases, both drawings constituting a single entry are published in order to develop more fully specific features of likely value. In other cases, only a single drawing is shown where this drawing adequately expresses the conception. In one or two instances, minor modifications of the designer's original layout have been made in order that features from the plan sheet could be incorporated with the general airport view.

In studying these selected designs, it will be discovered at once that many suggestions of exceptional merit have been presented. Since the judgment of the competition was necessarily based on comparative values rather than against absolute standards, the Jury found it necessary to weigh in the balance the strong and weak features, and to determine their selections accordingly. Thus some of the designs of great interest project tall buildings close to the flying field or in line with important runways. Others placed their buildings between runways. Both of these conceptions were considered to be unsound from an aeronautics point of view and caused the rejection of the designs during the final stages of the judgment. In other cases, the disproportionate use of land areas for approaches, service buildings, hangars, or for the maneuvering of planes, which would add to the cost of the airport without correspondingly increasing its capacity detracted from the otherwise excellent suggestions submitted by several competitors. It was upon economic grounds primarily that plans were rejected from the award group which placed buildings in the center of the airport, because this location established the necessity for immediately creating underground approaches to these buildings long before the airport would have sufficient traffic to warrant such expensive constructions. Architectural merit alone was not sufficient to place some of the most beautiful designs in the prize winning or honorable mention group; while on the other hand inferior architectural treatment was not permitted to overbalance excellent conceptions from an aeronautics, city planning and engineering point of view.

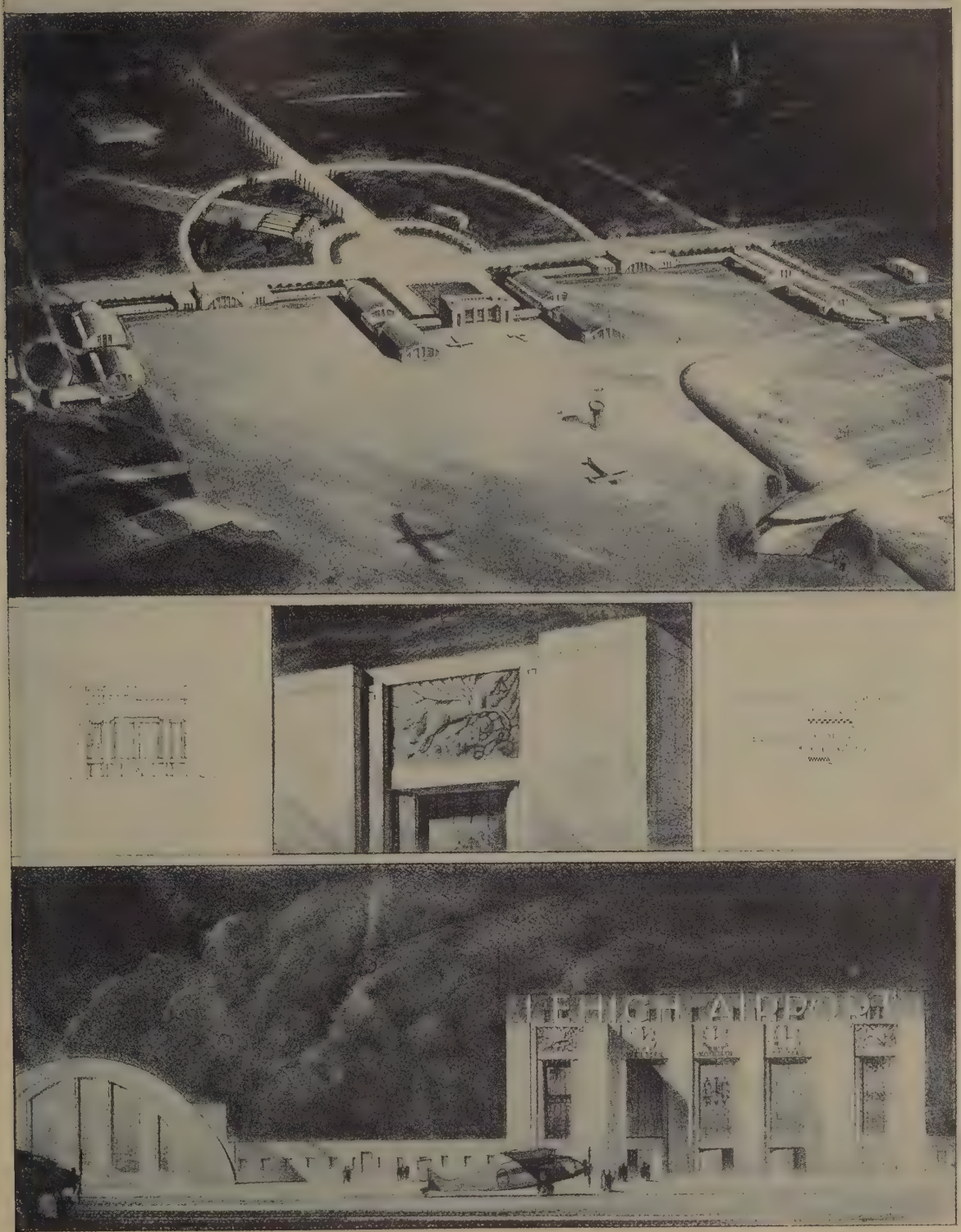
It is quite possible that in the future some of the features considered objectionable today will prove entirely practical. It is even conceivable that there may be airports established upon the roofs of skyscrapers as suggested by the design presented on the facing page. Such visionary ideas and such departures from practices that appear sound under existing conditions were considered to be beyond the expressed purpose of the competition, and for this reason did not receive serious consideration during the culmination of the judgment.

The future alone can tell which of the airport ideas presented in this competition will survive and which will ultimately prove of greatest value. In selecting these designs, therefore, an effort has been made to publish the widest possible variety of conceptions the contest brought forth, in addition to those found in the premiated group. Where several designs of similar character were submitted, the one most representative of the group was chosen for these pages.

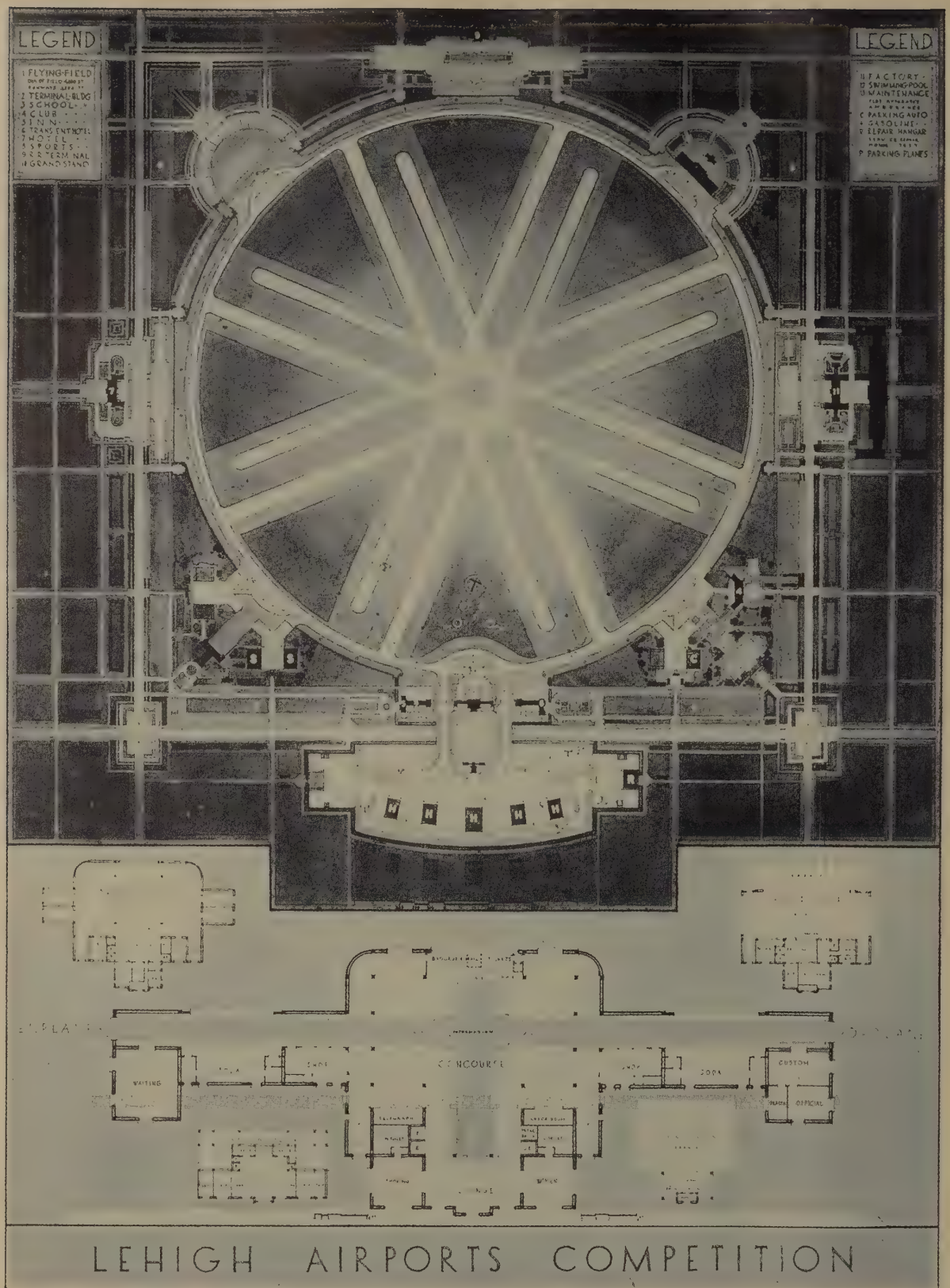


Designed by William N. Gillette of Walker & Gillette, Architects, New York, N. Y.

LEHIGH≈AIRPORT≈COMPETITION

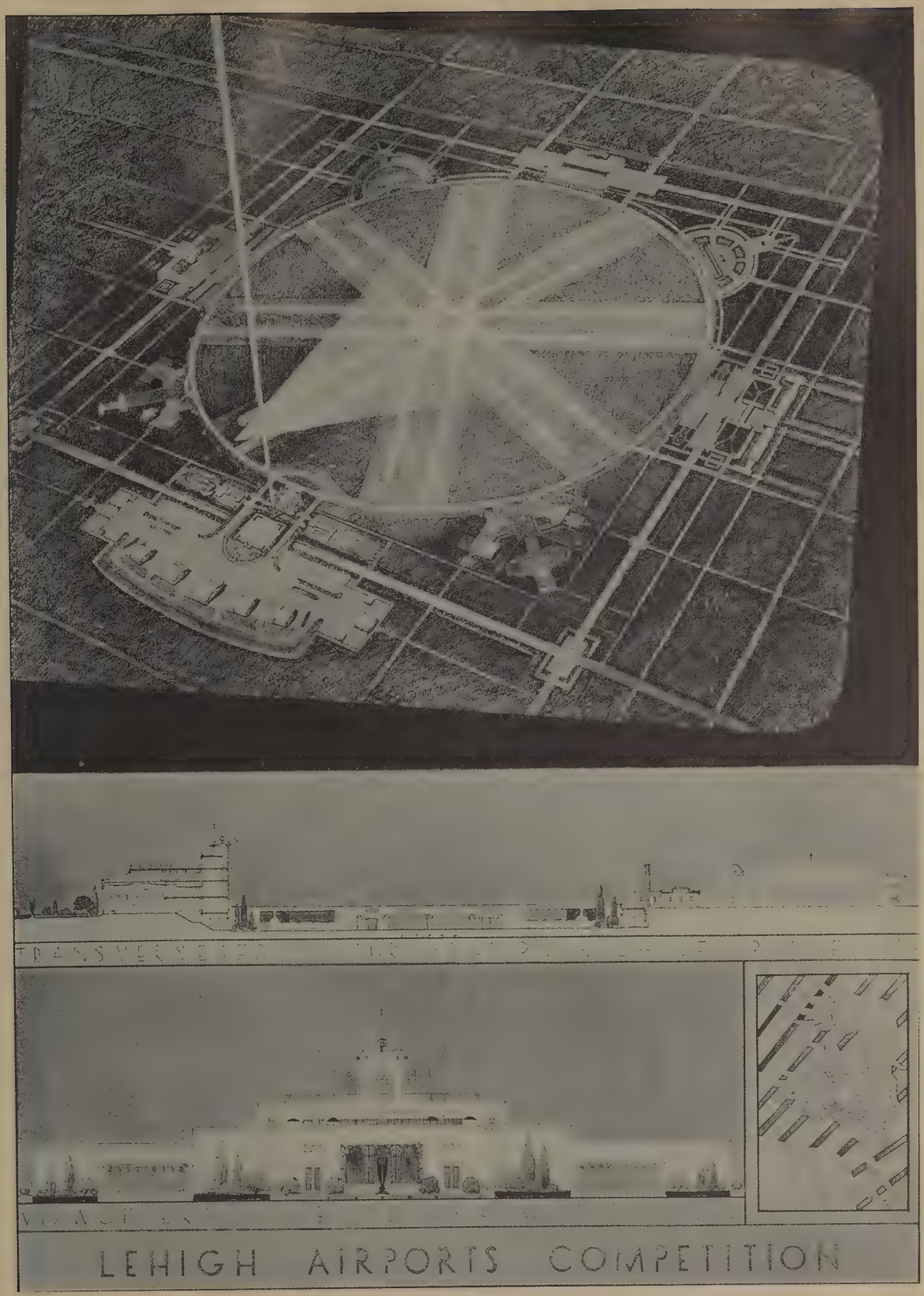


The fan-shaped runway plan requires double the land area of an airport using crossed runways

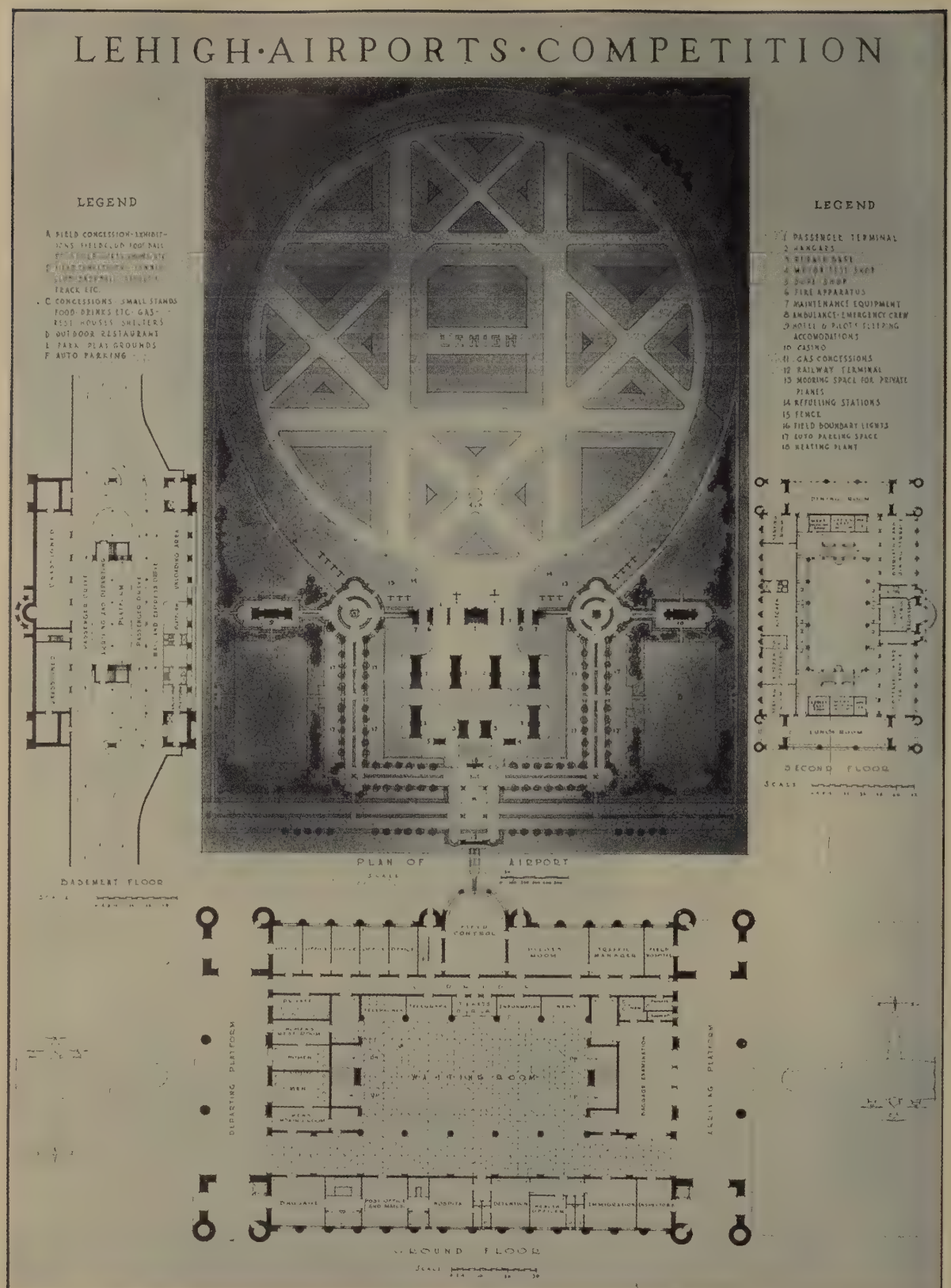


LEHIGH AIRPORTS COMPETITION

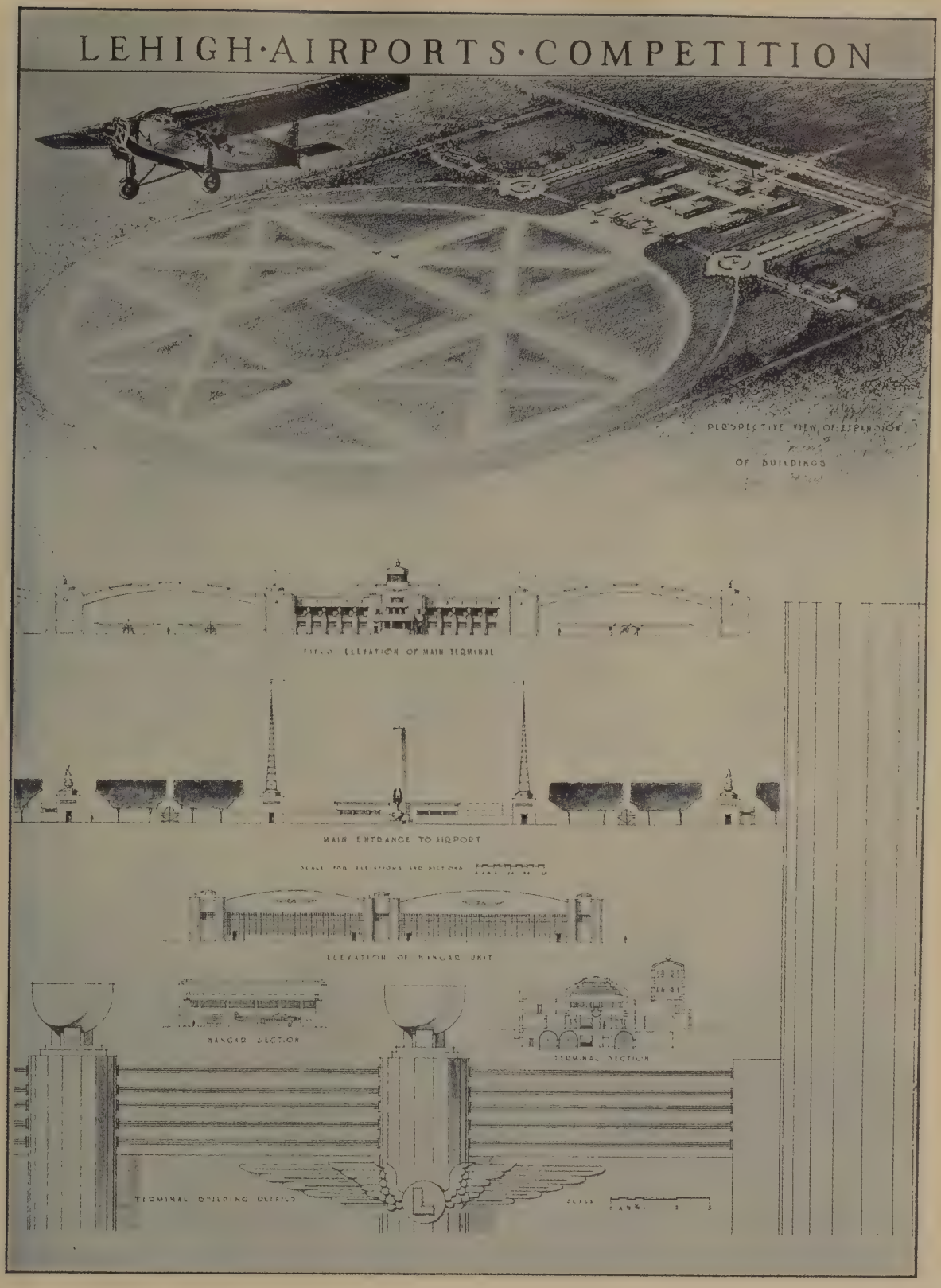
Designed by Captain Frederic Bowne and Fernand Aubry, A.D.P.L.G. of American Airports Corporation, New York; Mann & MacNeille, James Renwick Thomson, A. I. A., Associate Architects, New York, N. Y.



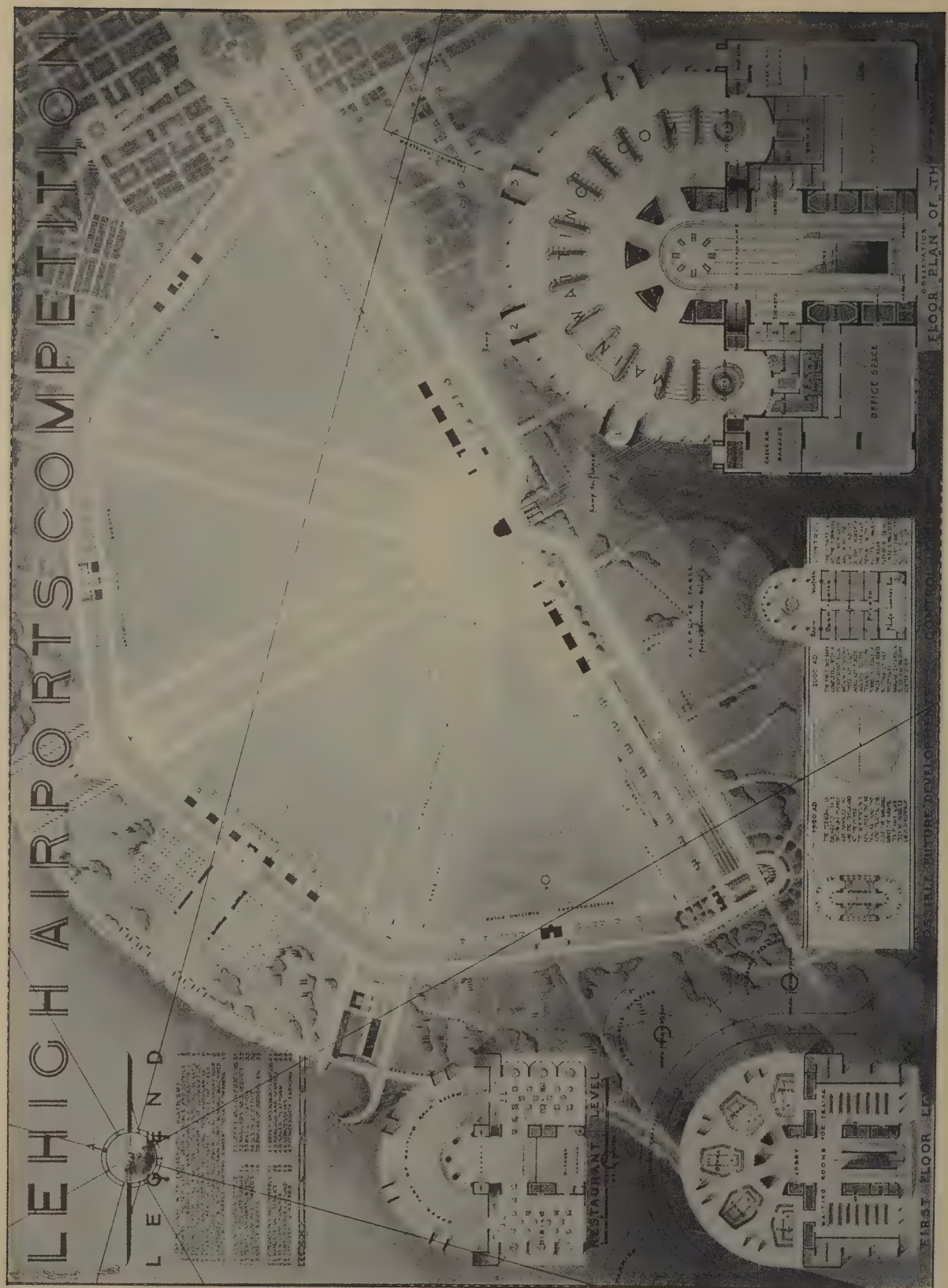
This ingenious arrangement of parallel runways which join the taxi strip at one end only, automatically segregates arriving and departing planes by a simple indication clearly visible from the air



Designed by John Theodore Haneman of Rogers & Haneman, Architects, New York, N. Y.

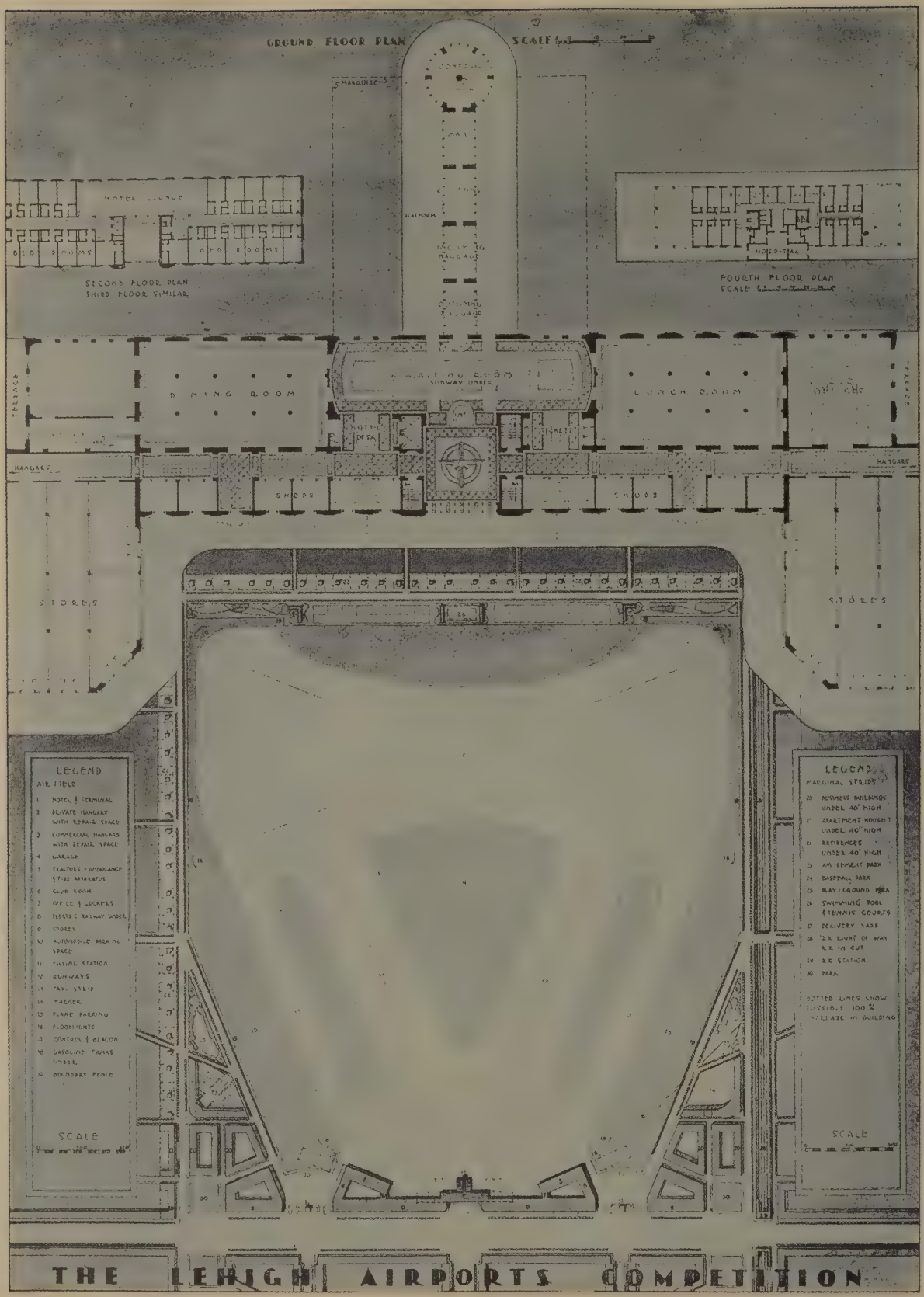


The passenger terminal is placed between the service buildings and the flying field

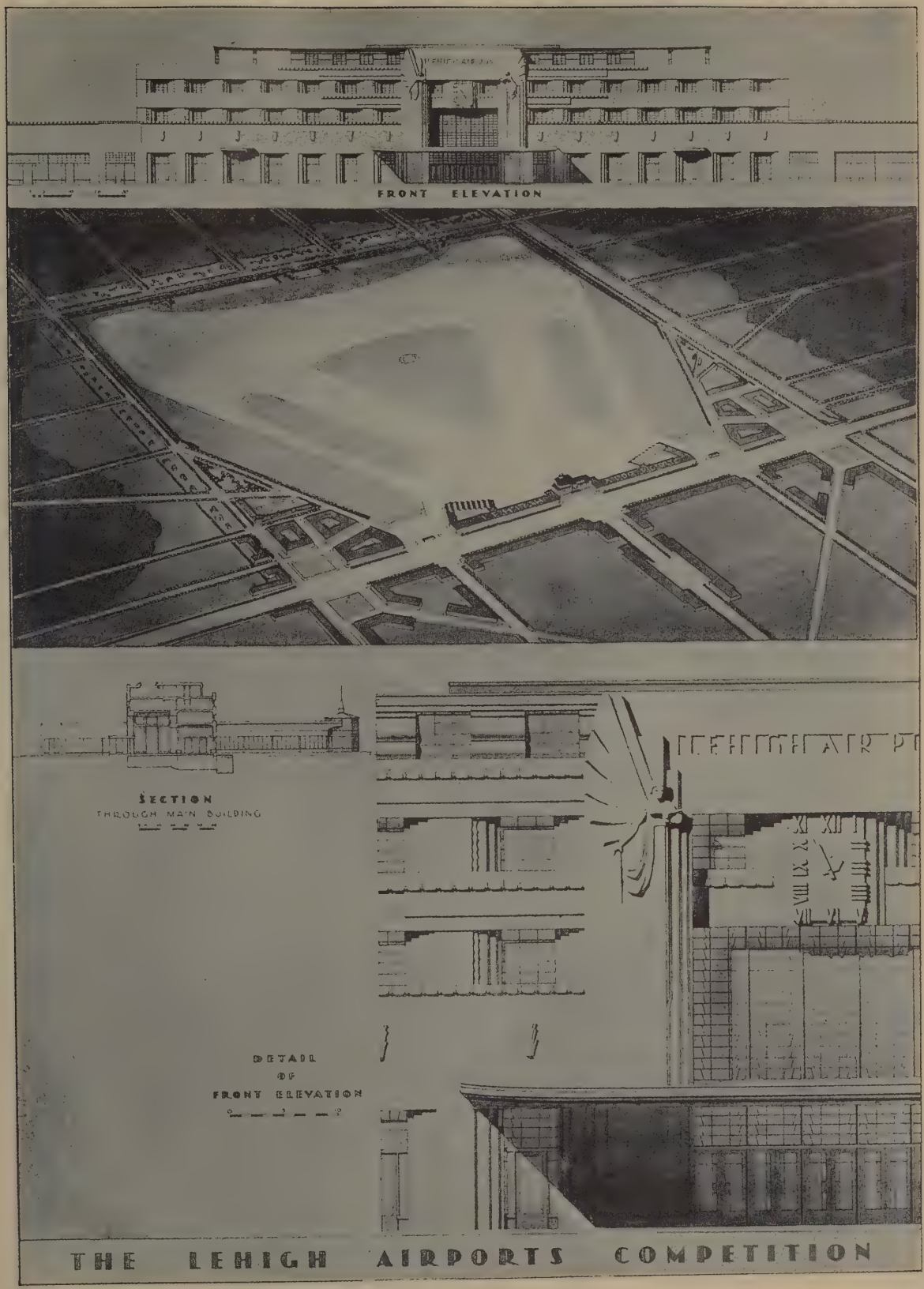


Designed by J. Roy Carroll, Jr., and Donald Barthelme, Architects, City Planners and Engineers, Philadelphia, Penna.

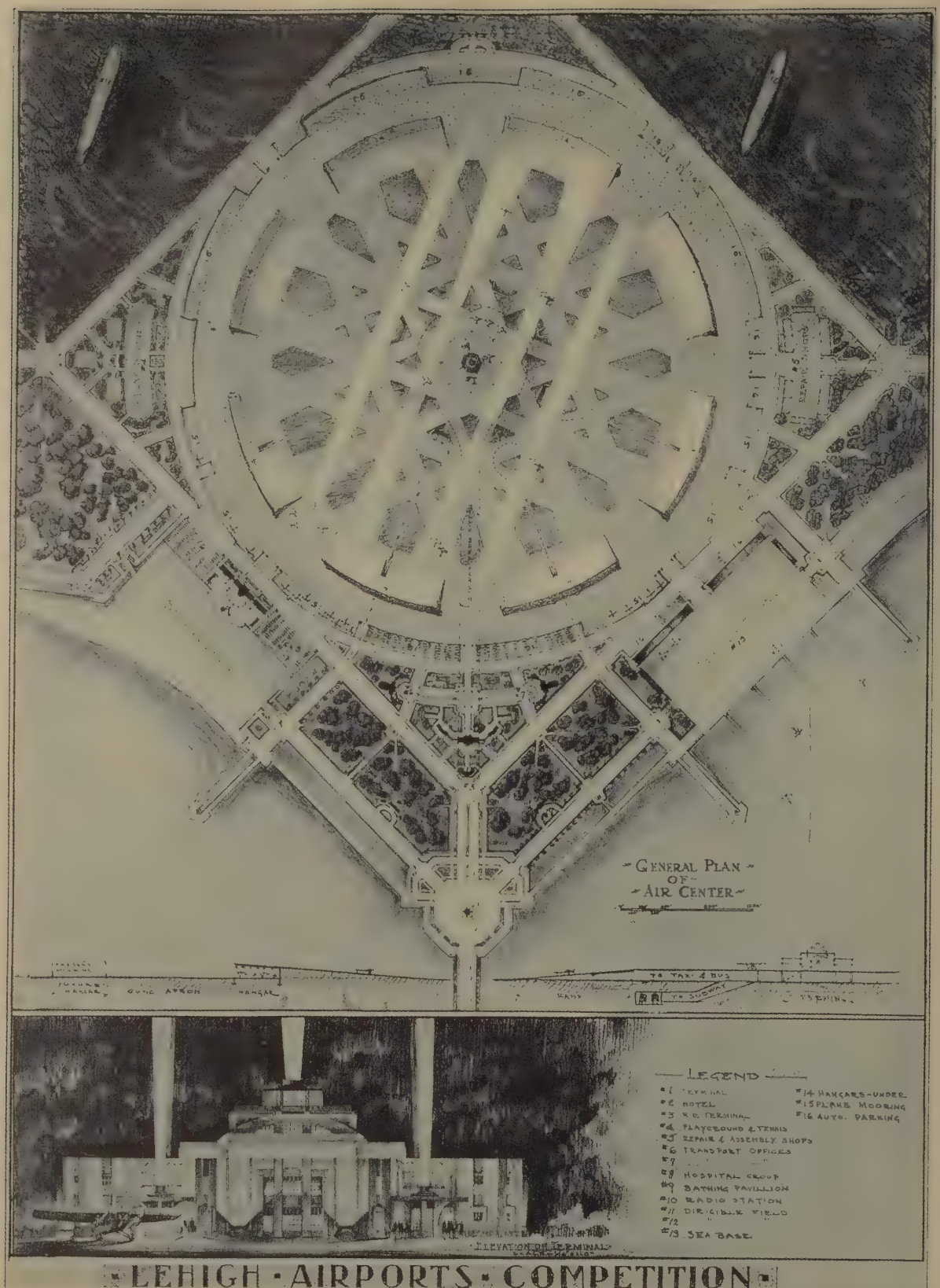
Planned for a great volume of airport traffic with provision for future expansion but requiring excessive land areas



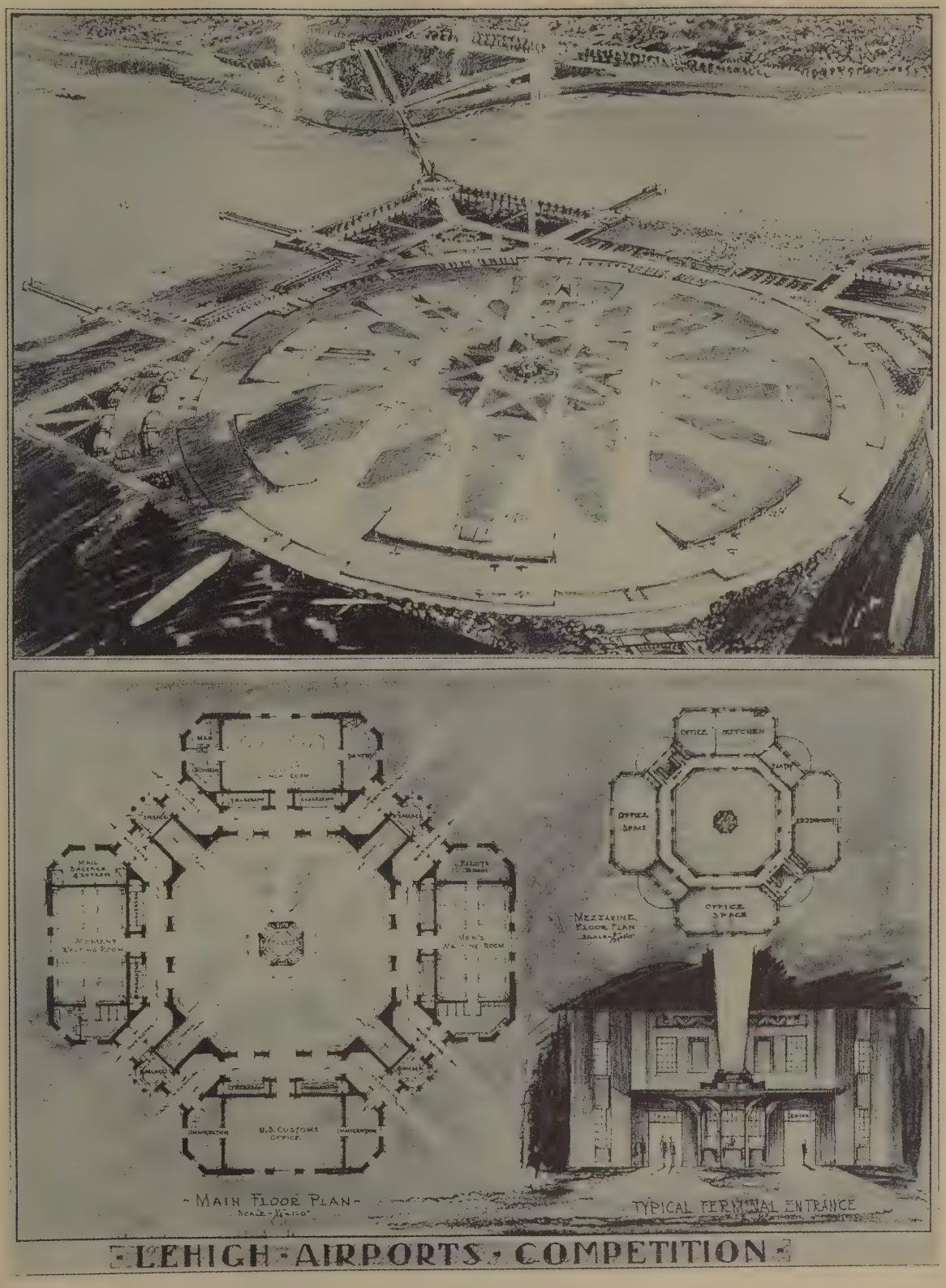
Designed by Richard Haviland Smythe, Architect, New York, N. Y.



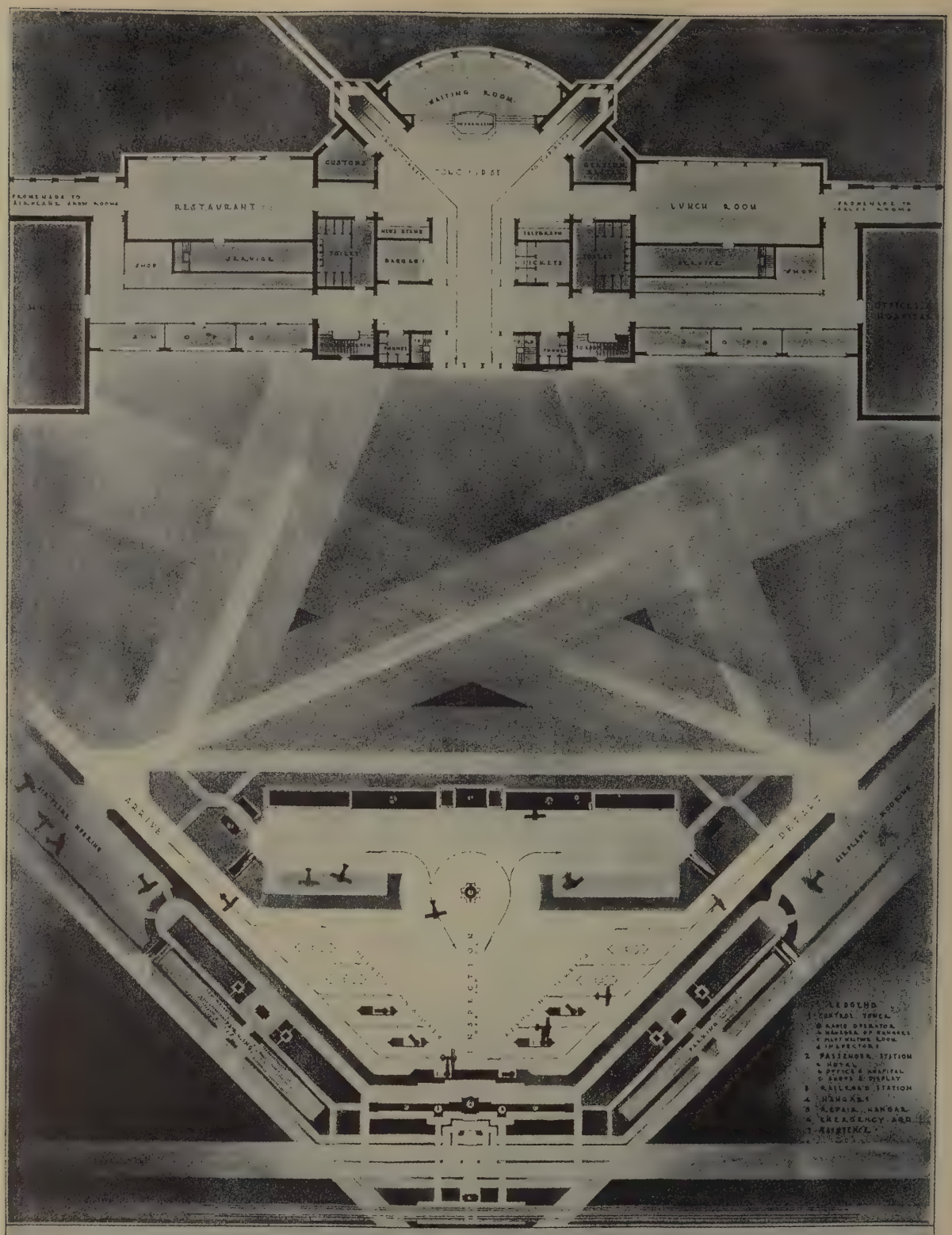
A runway plan that approaches the all-over paved field



A circular field with multiple runways of great capacity, designed by H. T. Holcomb, Wilmette, Illinois



The loading point in the center of the field is reached by an underground concourse. Hangars are partly submerged around the perimeter

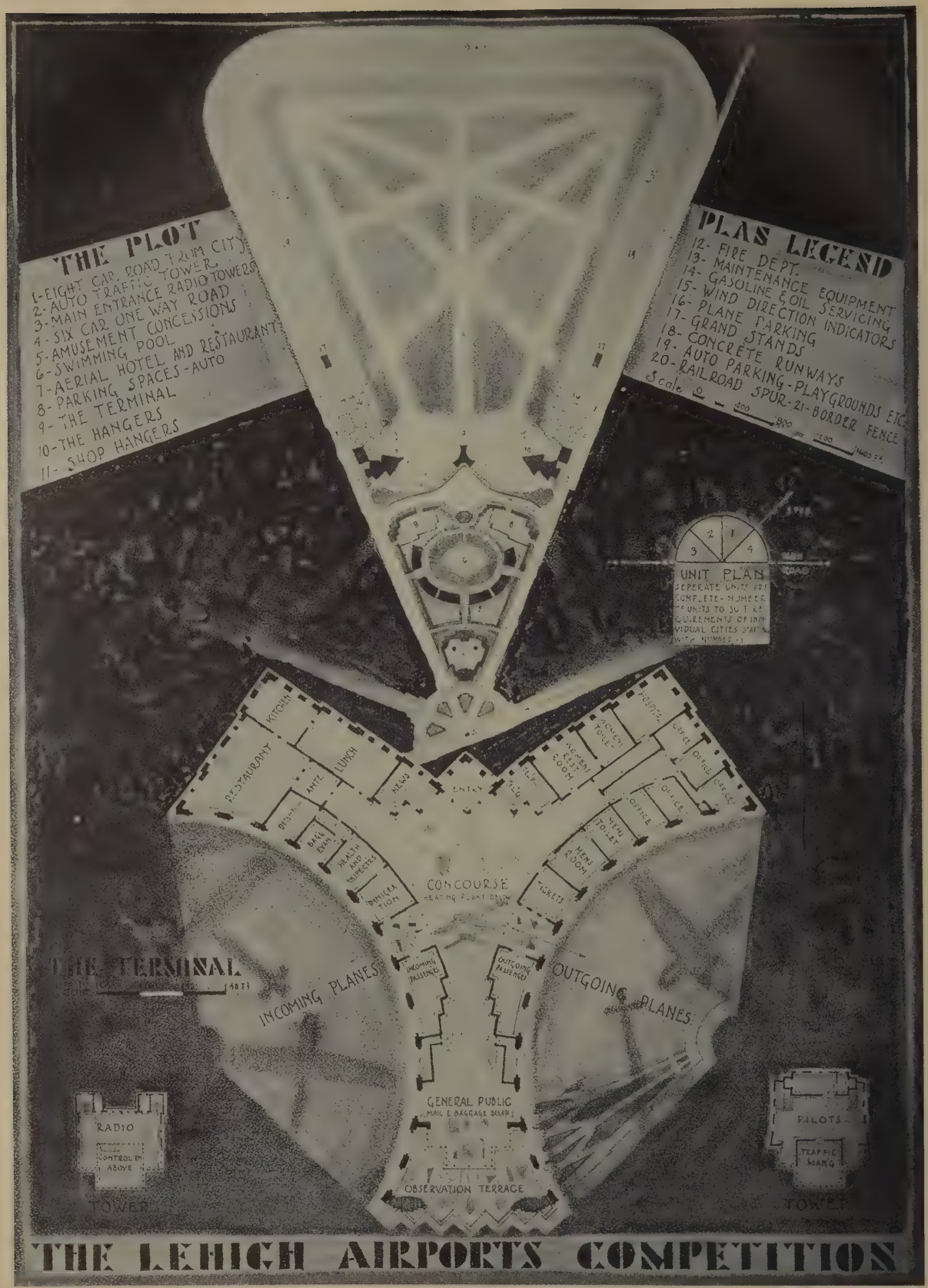


LEHIGH AIRPORTS COMPETITION

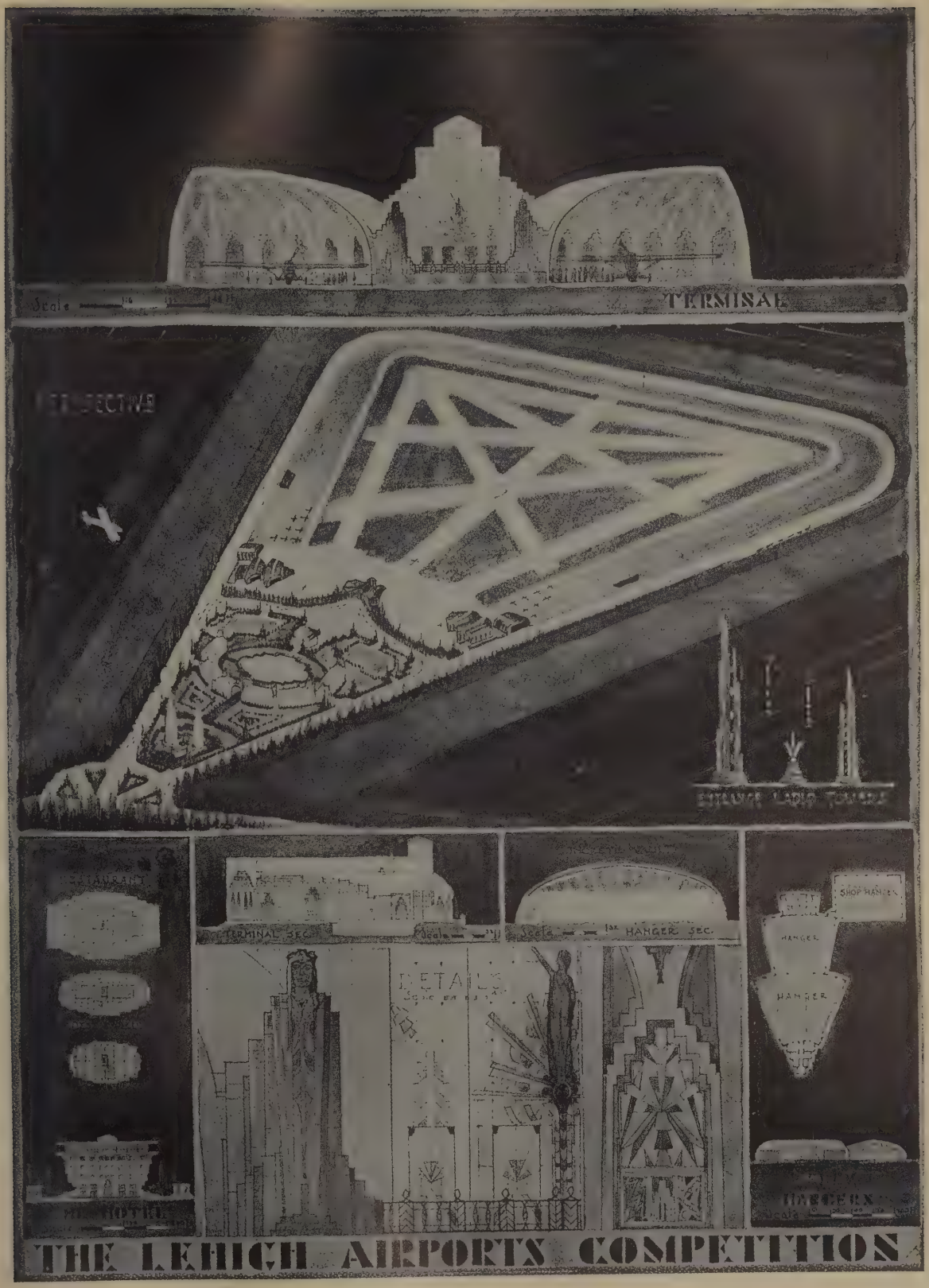
Designed by Howard Bordewich and William F. Koenig, Chicago, Illinois

LEHIGH AIRPORTS COMPETITION

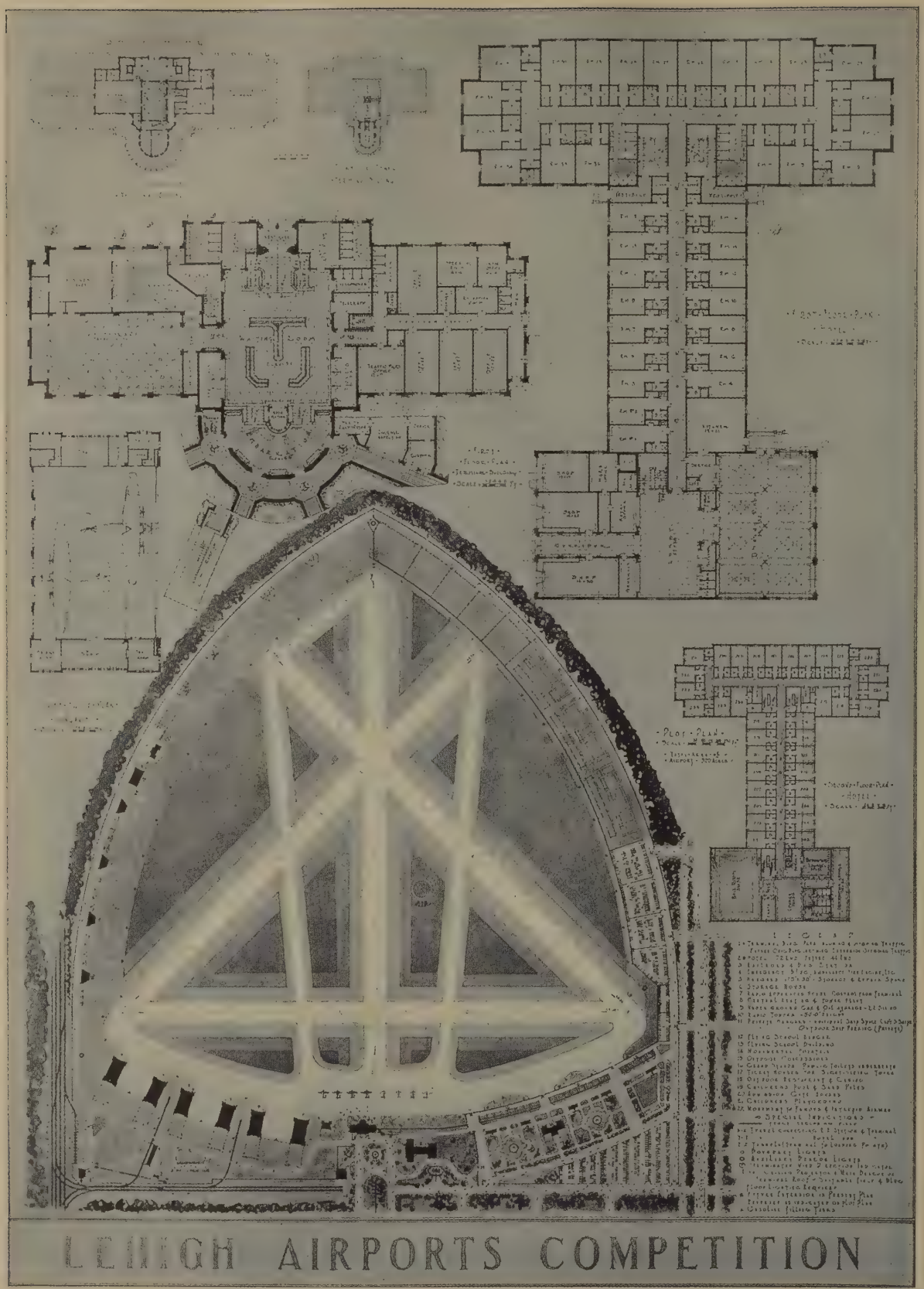
Revolving turrets, reached by underground passages, protect passengers entering or leaving planes



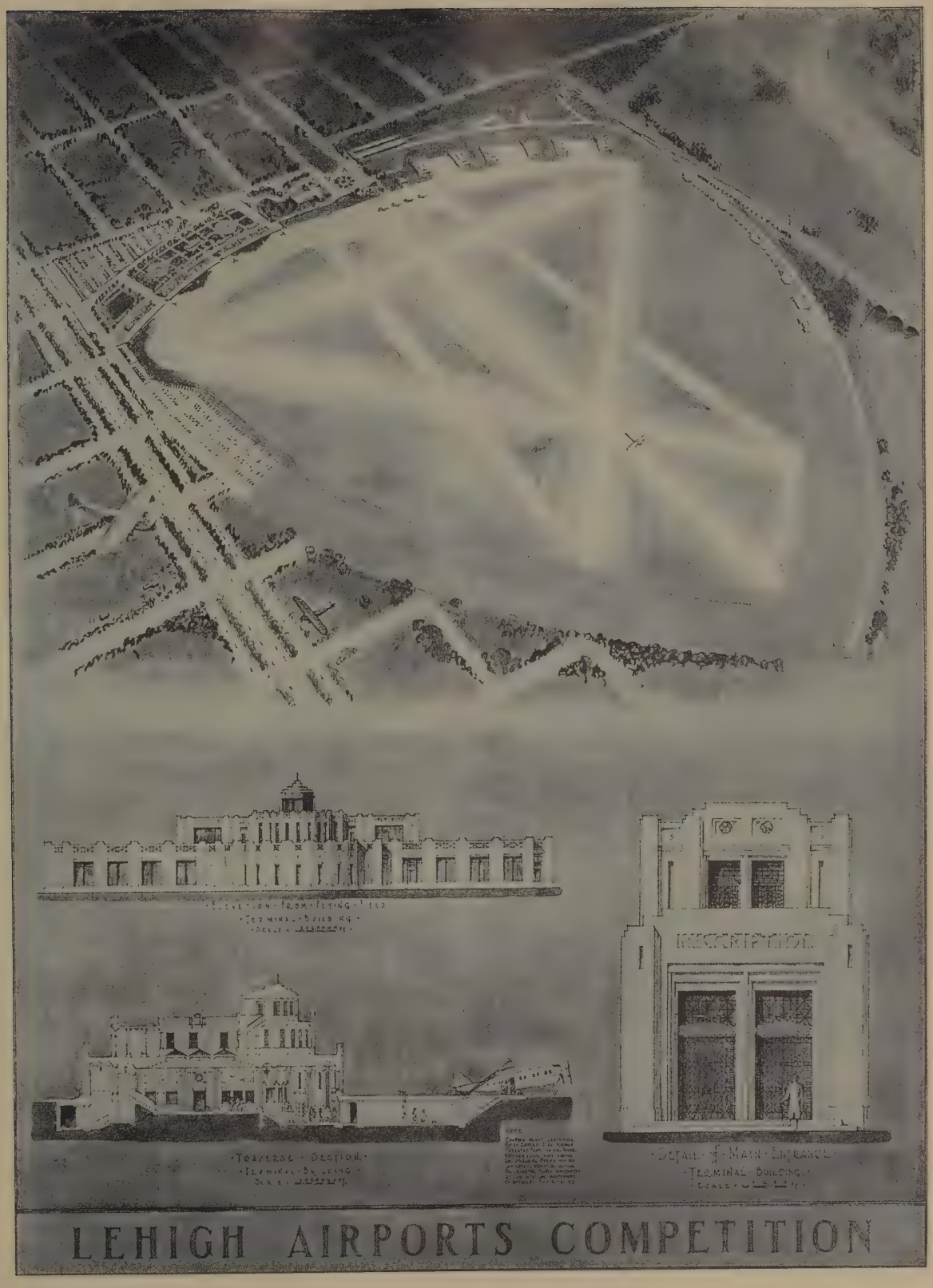
A triangular-shaped airport designed by Fred Fornoff, Architect, Columbus, Ohio



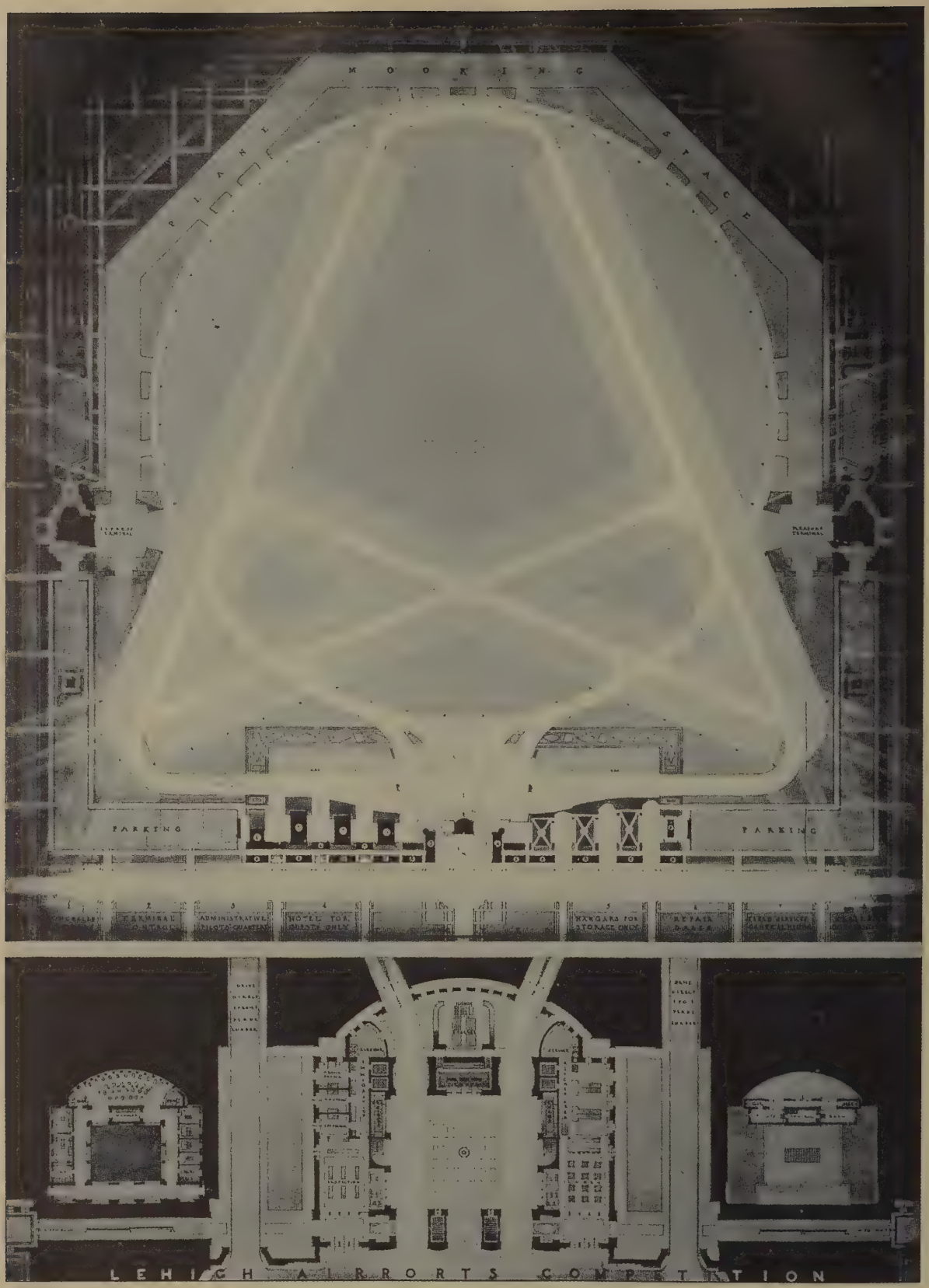
Designed to provide for future expansion by adding similar fields on either side



Designed by K. L. Hayden, Brooklyn, N. Y.

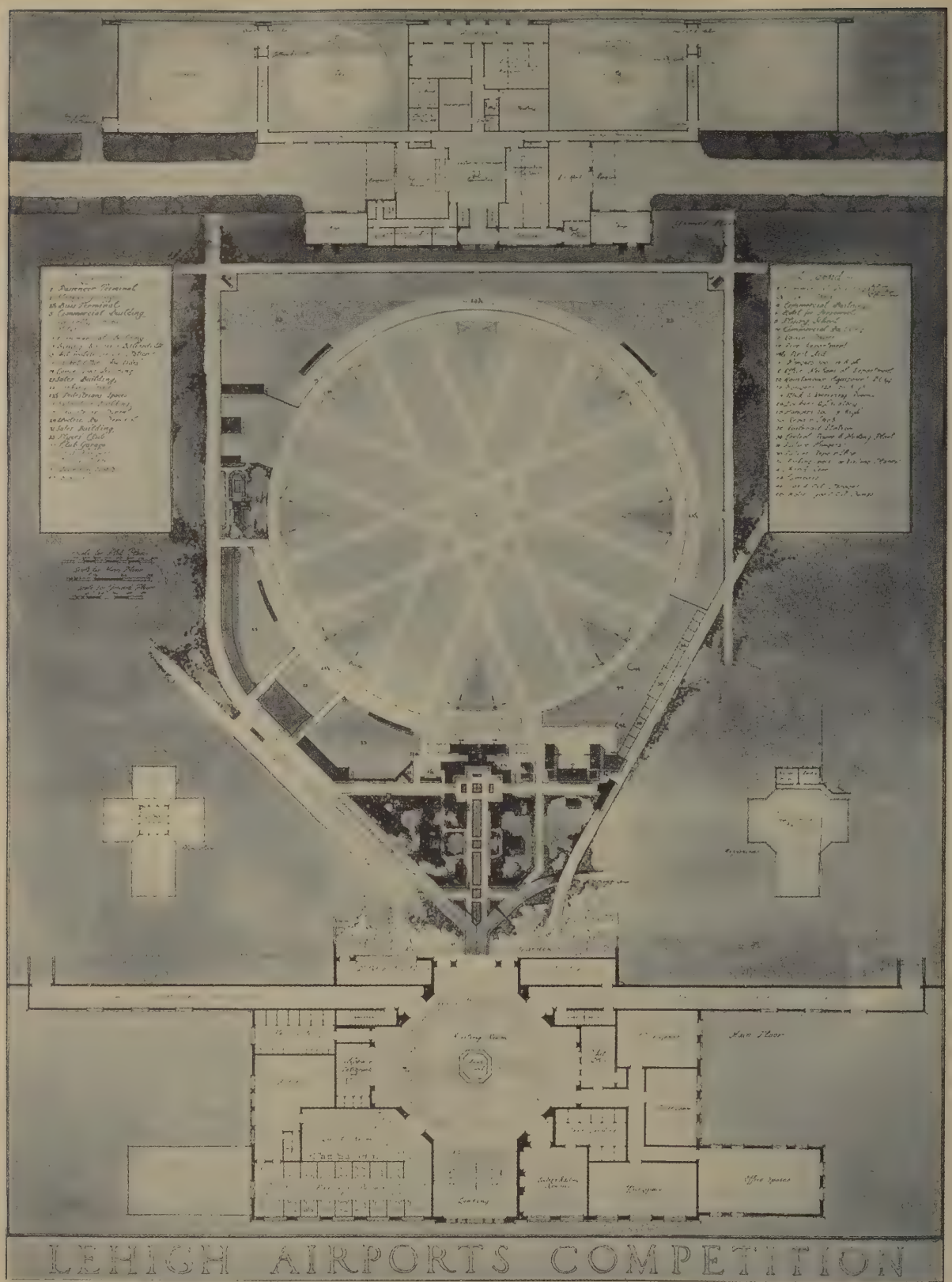


Counterweighted cantilever hatch covers are employed for access to planes

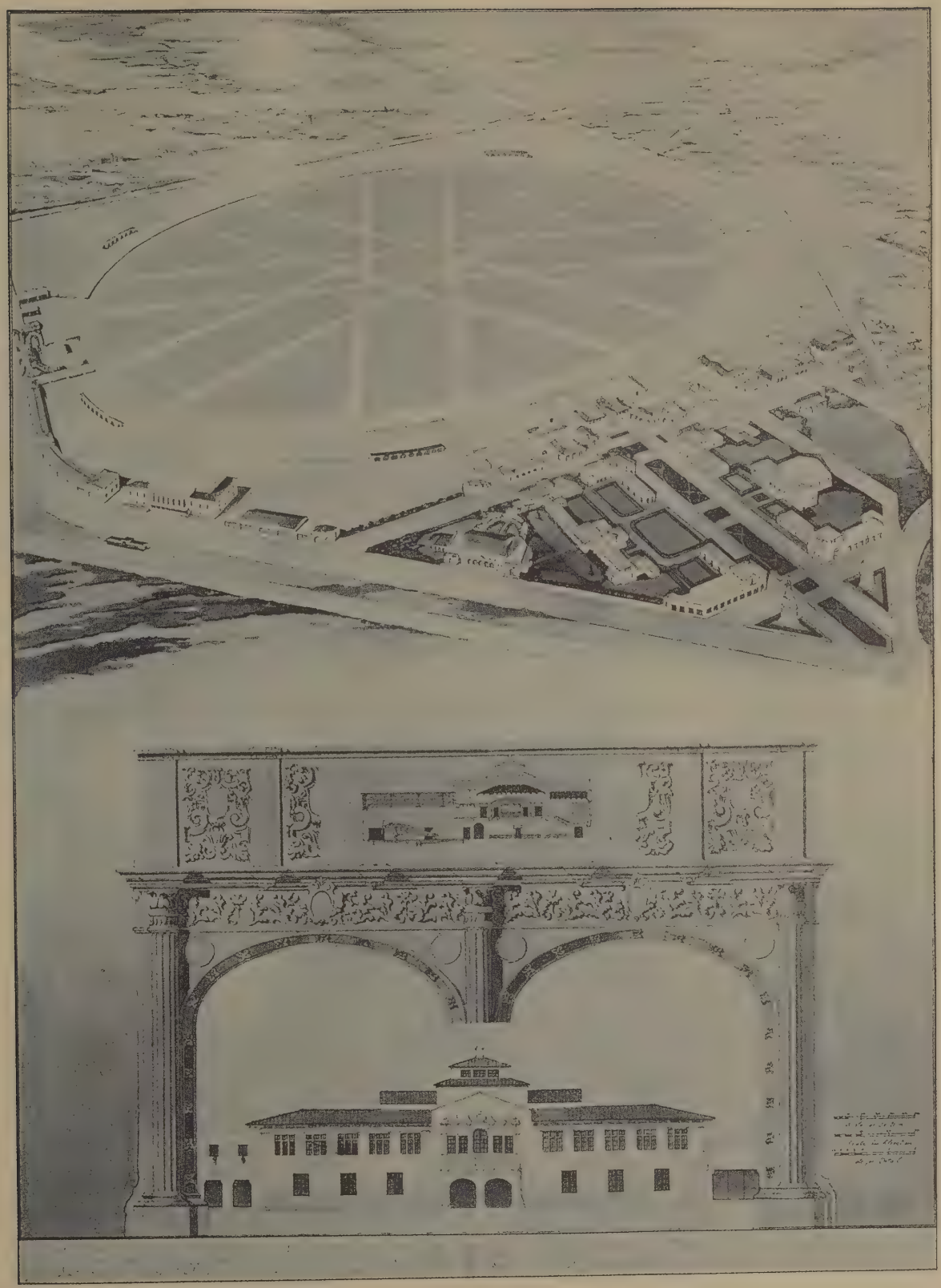


Designed by M. E. Boyer, Jr., Architect, Charlotte, North Carolina

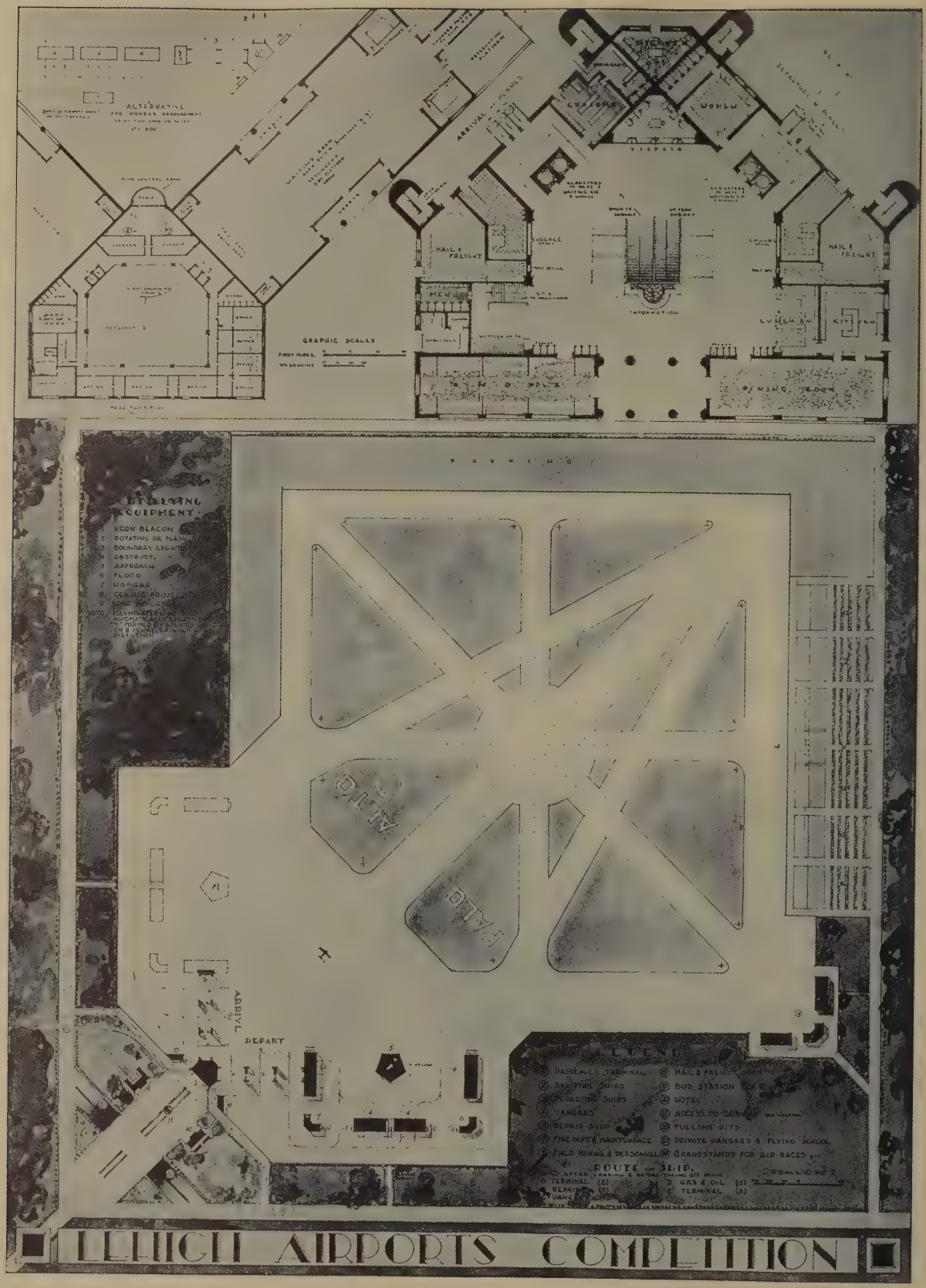
Concealed loading turrets (patents applied for) are provided for passenger protection



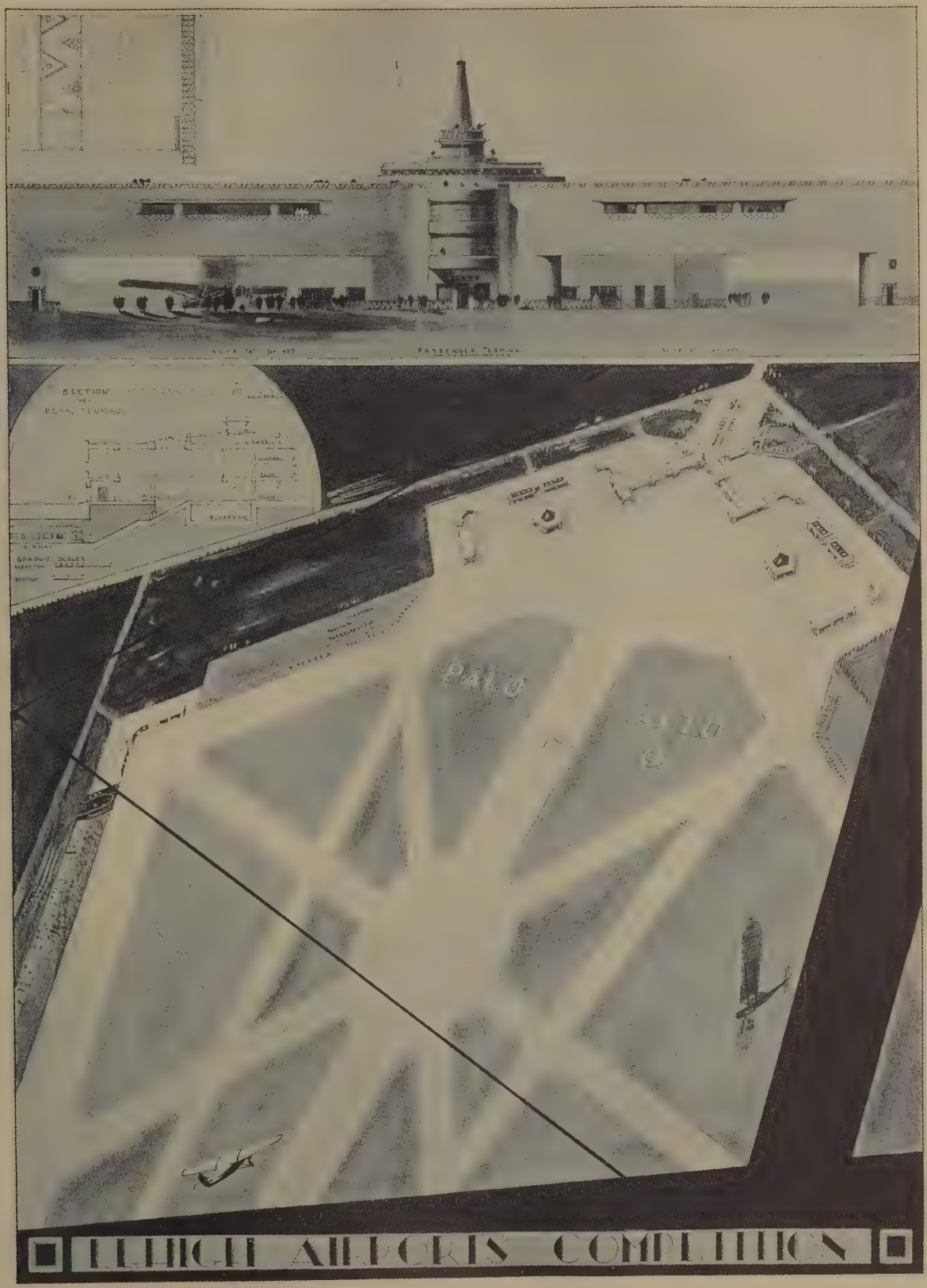
Designed by Clarence L. Jay, Pasadena, California



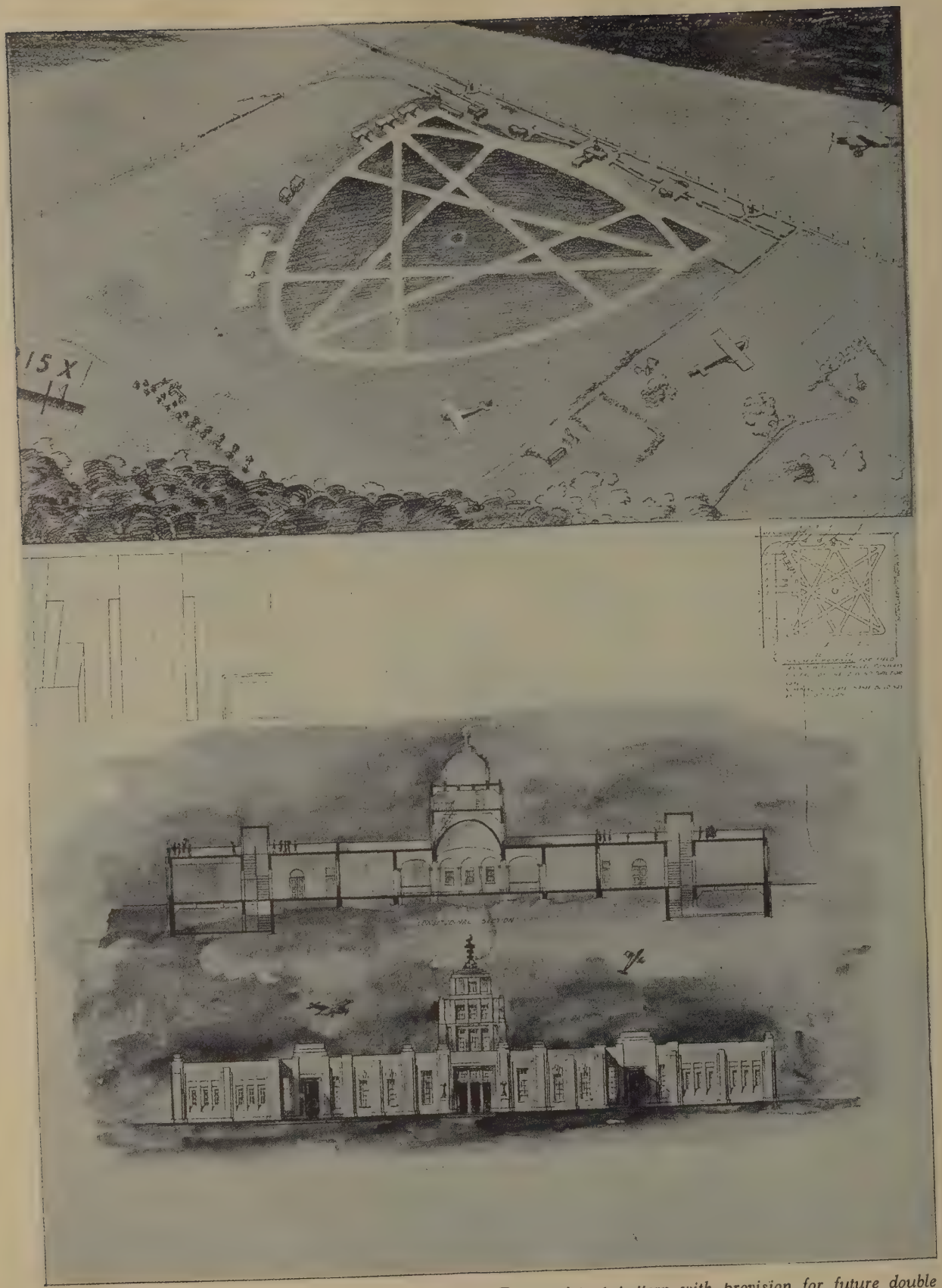
Hangar-like structures with turntable floors are used as loading and unloading docks



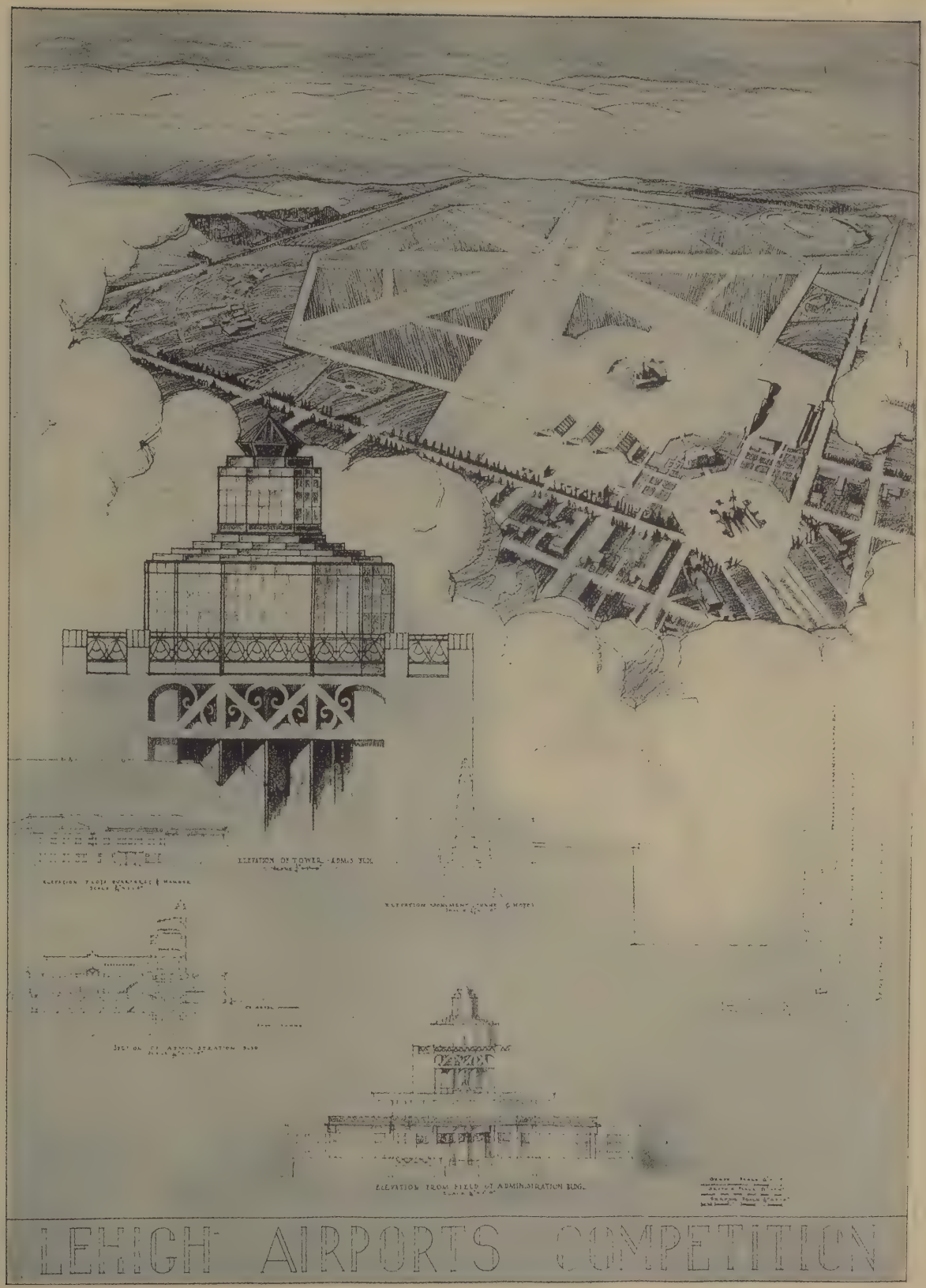
Designed by James Leonard Cannon, San Francisco, California



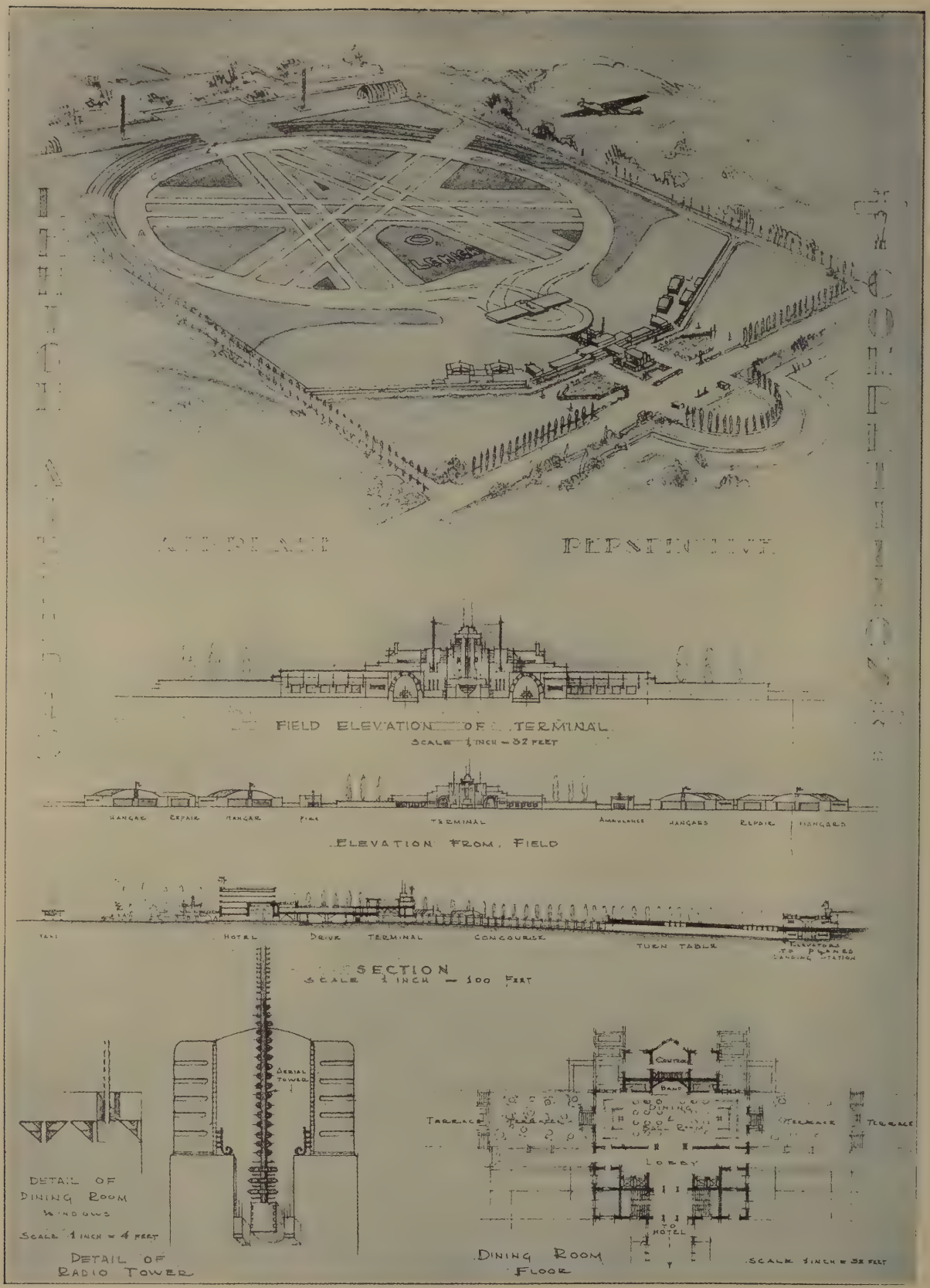
A modernistic passenger terminal with waiting rooms above the loading docks



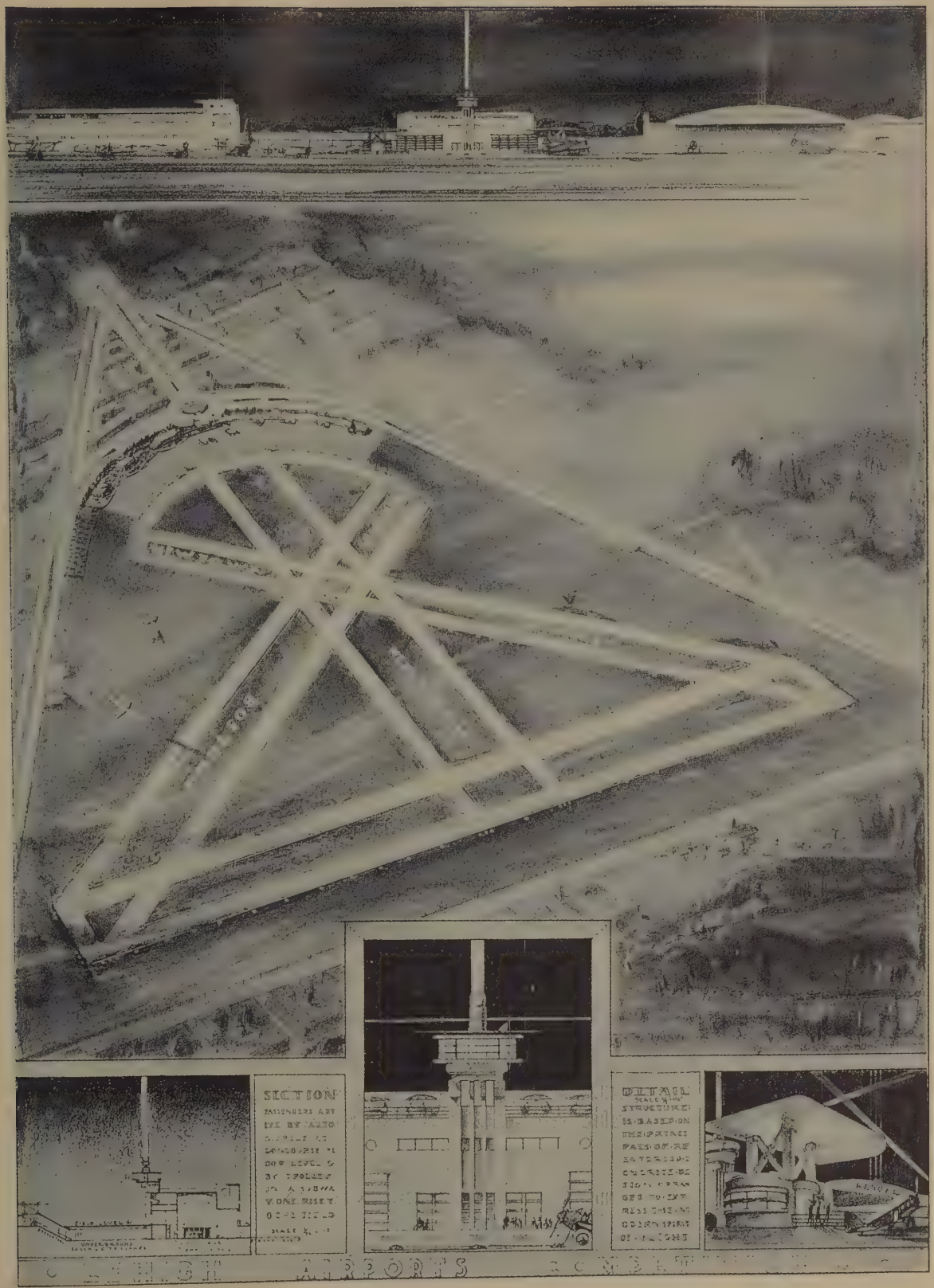
A typical Triarc airport pattern with provision for future double runways designed by Charles L. Nord, New Haven, Connecticut



Designed by Bebb & Gould, Architects, Jack Paterson, Associate, Seattle, Washington. The loading point is projected into a sector between runways

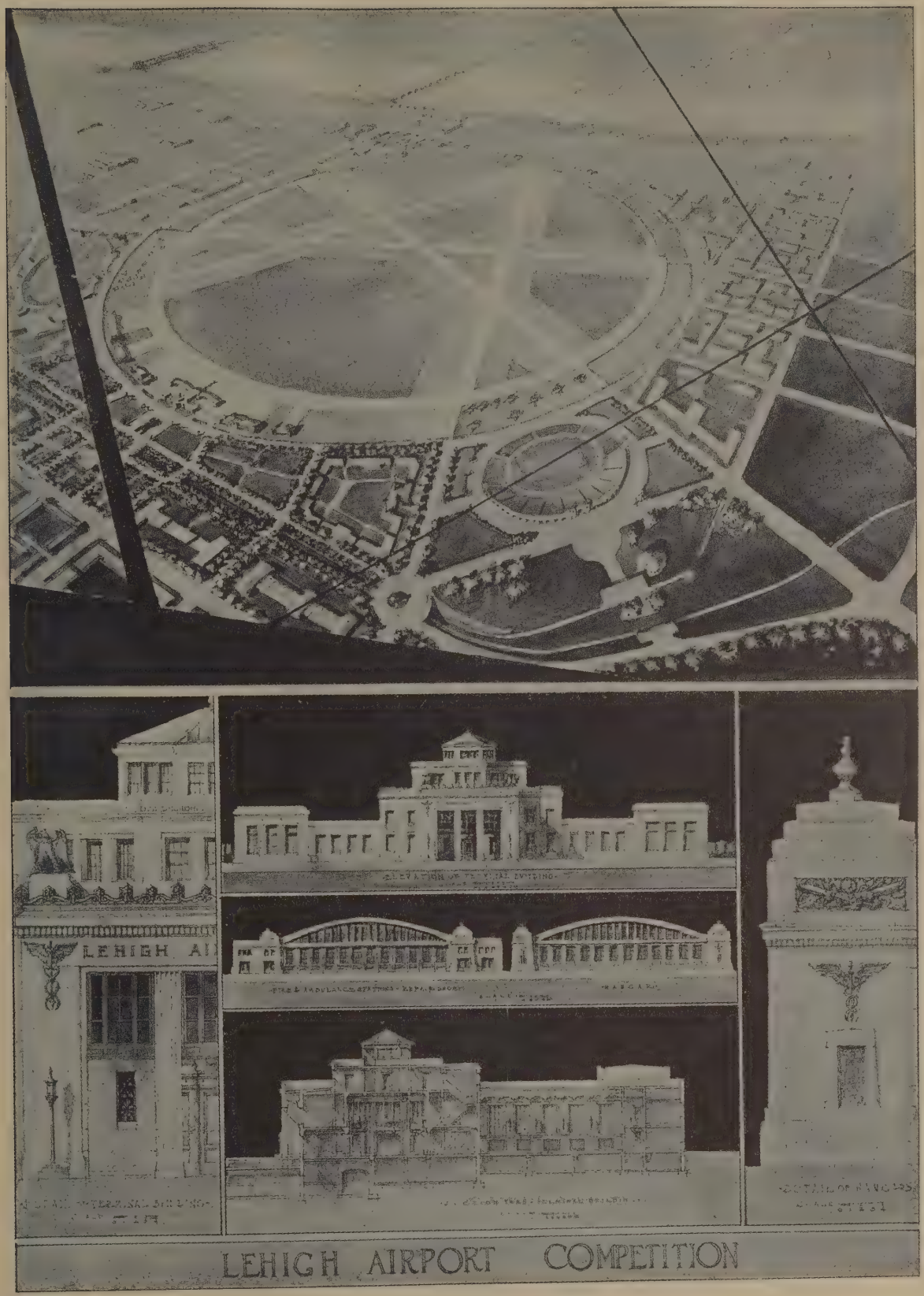


A sloping platform serves as a turning point for planes in this design by Arthur B. Gallion of Urbana, Illinois

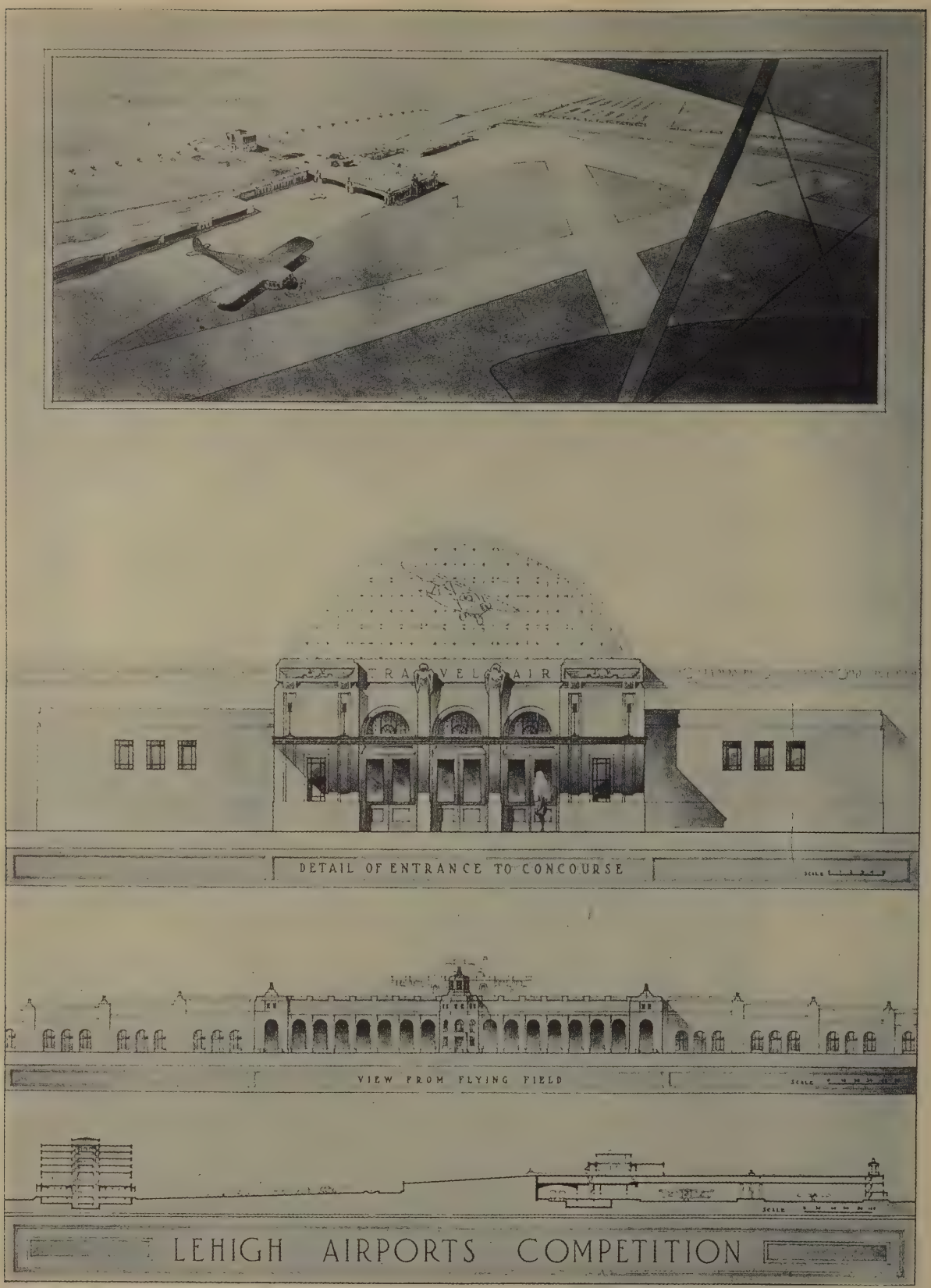


Robert C. Dean of Boston, Mass., suggests in his design a pair of covered loading points of modernistic pattern projected into the maneuvering apron

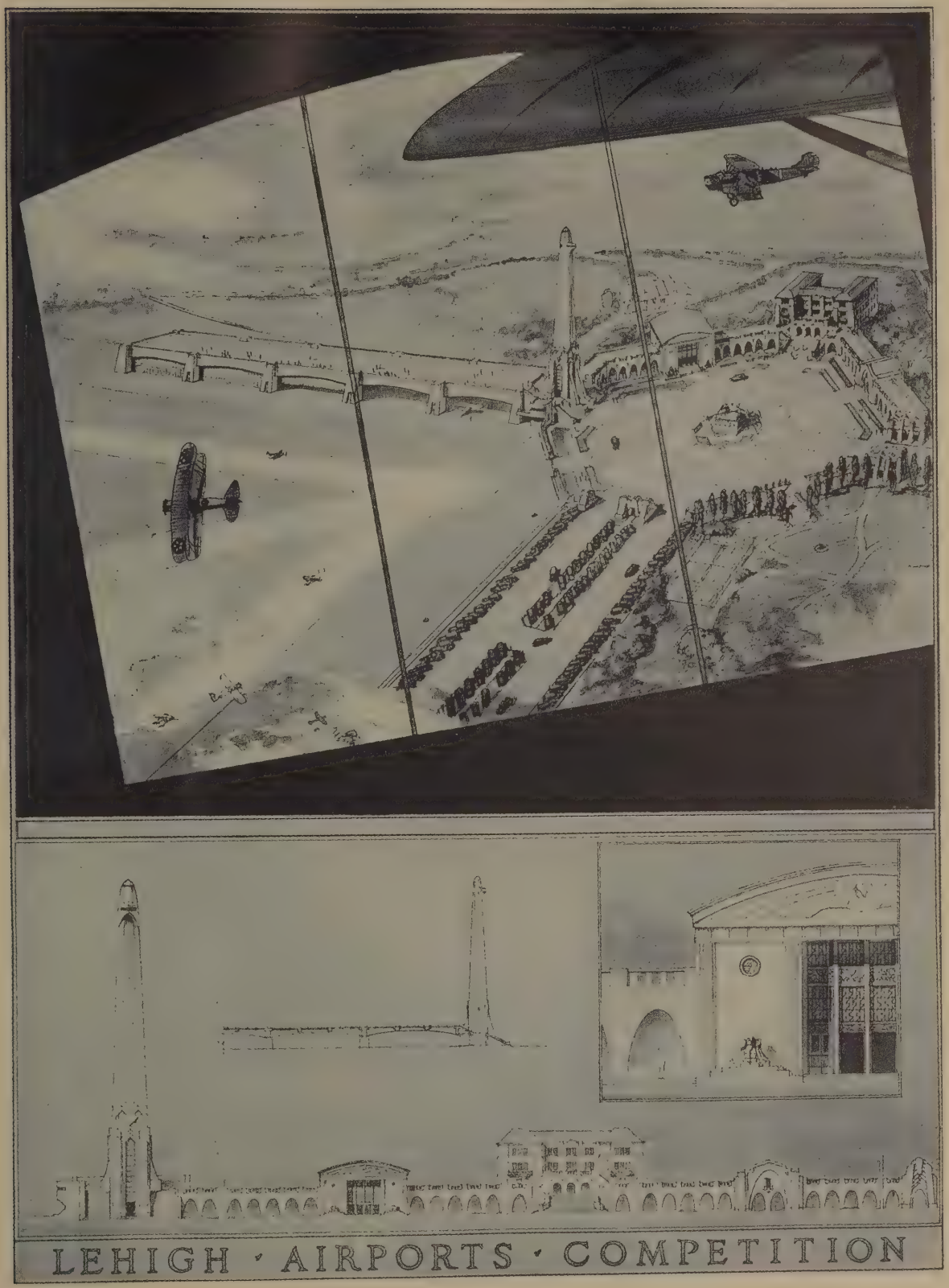
Designed by Major Edward M. Urband, Bloomfield, N. J. Runways bordering the rectangular field are separated from buildings by marginal areas



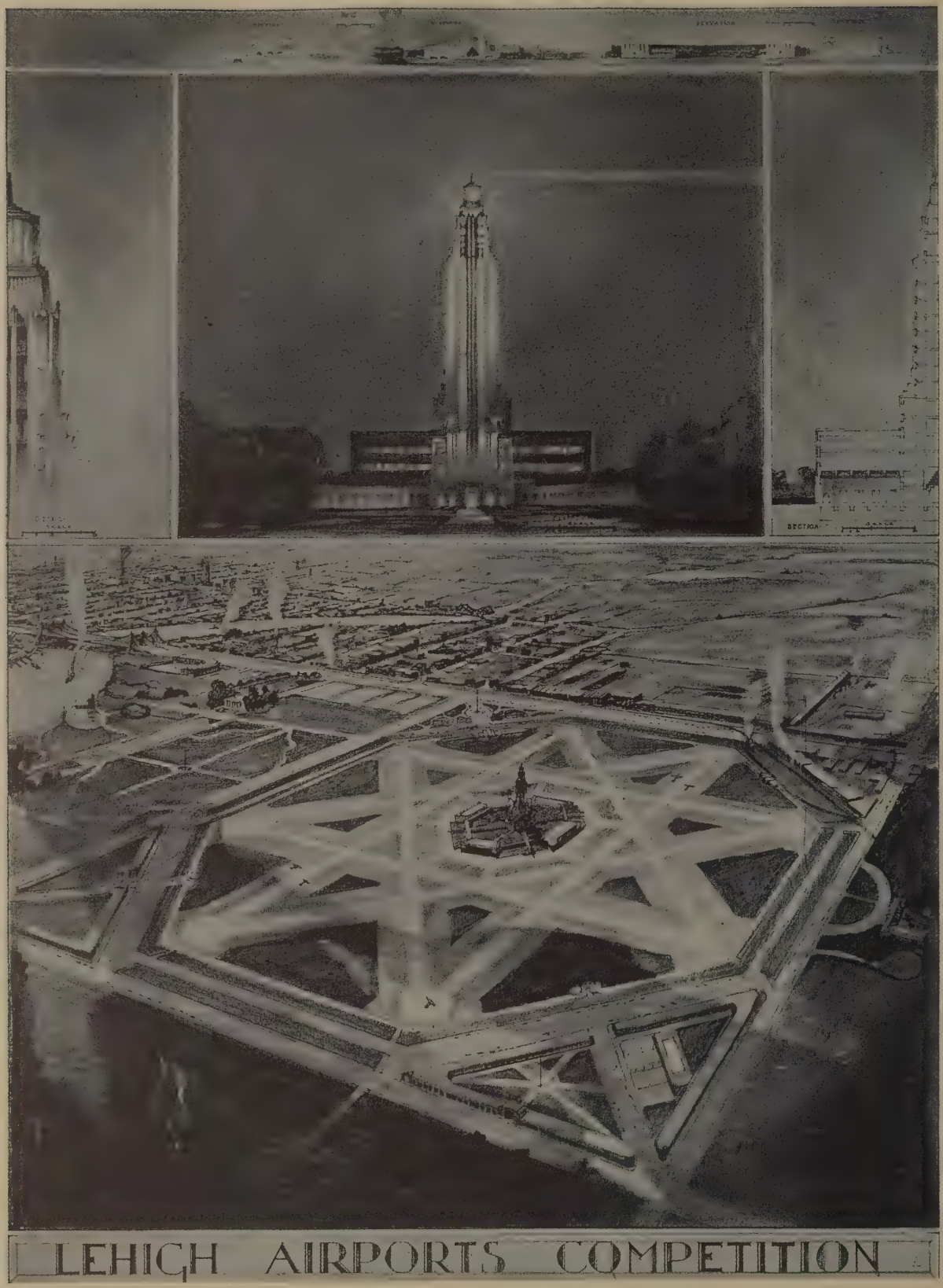
Norman L. Wilkinson and Alfred W. Hertz, Kansas City, Missouri, have here employed radial highways to extend the effective length of the major runways



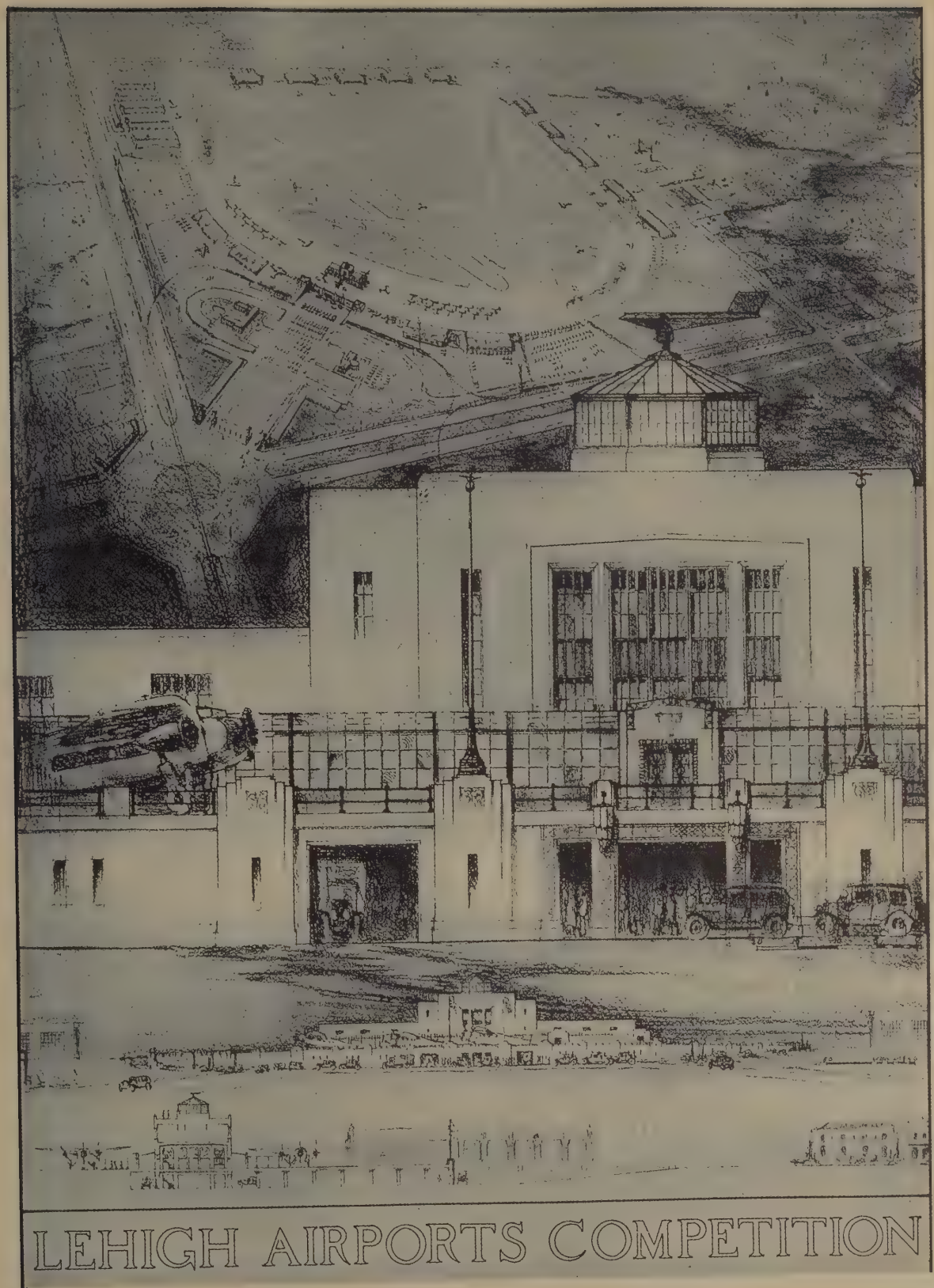
Designed by Walter J. Campbell, Architect, Danbury, Connecticut. The roof area of the loading docks is employed as a public observation terrace



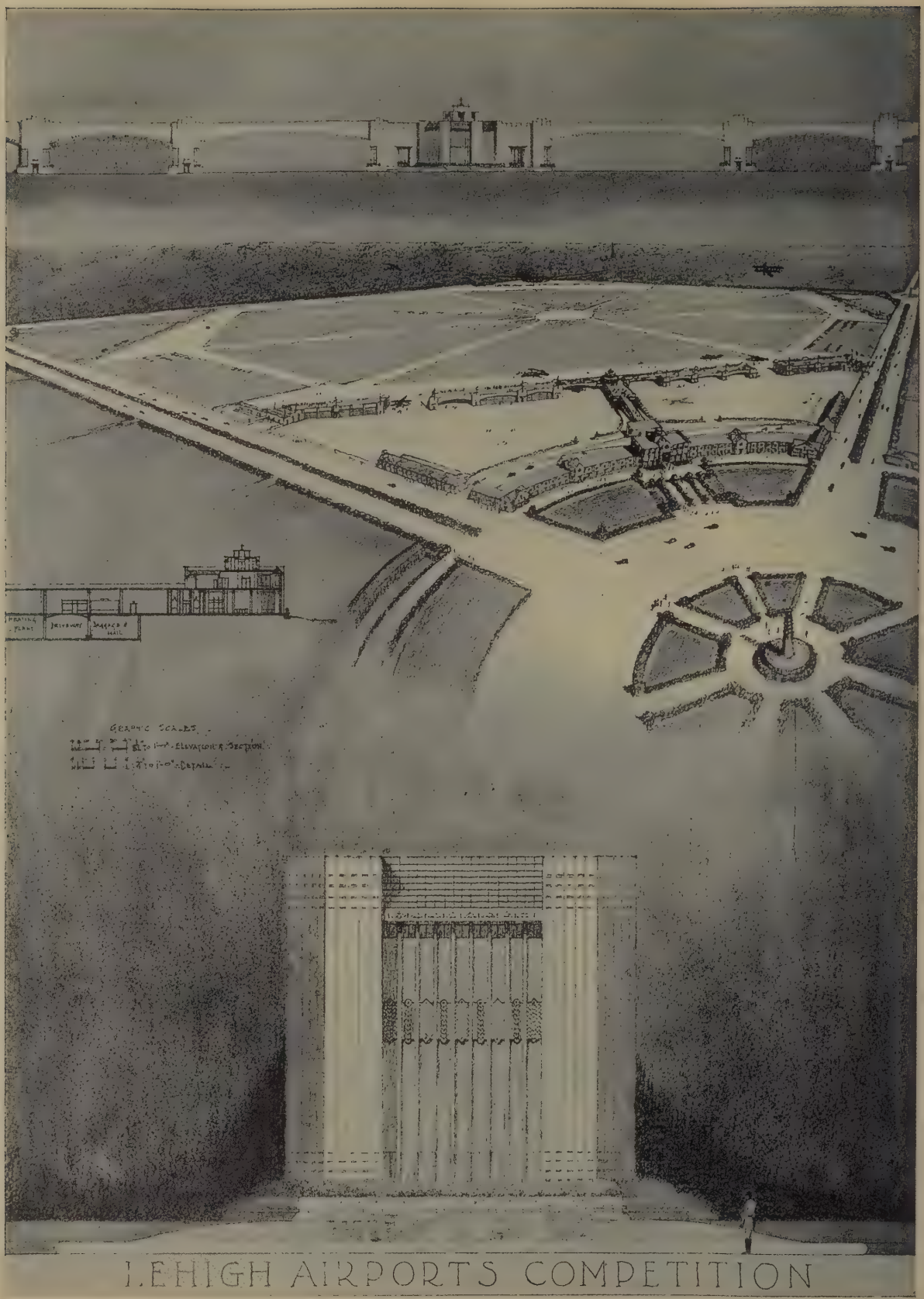
In this design by Britton Kirton, Architect, Jacksonville, Florida, the hangar roofs constitute a public observation platform. The tower is a dangerous element that should be omitted



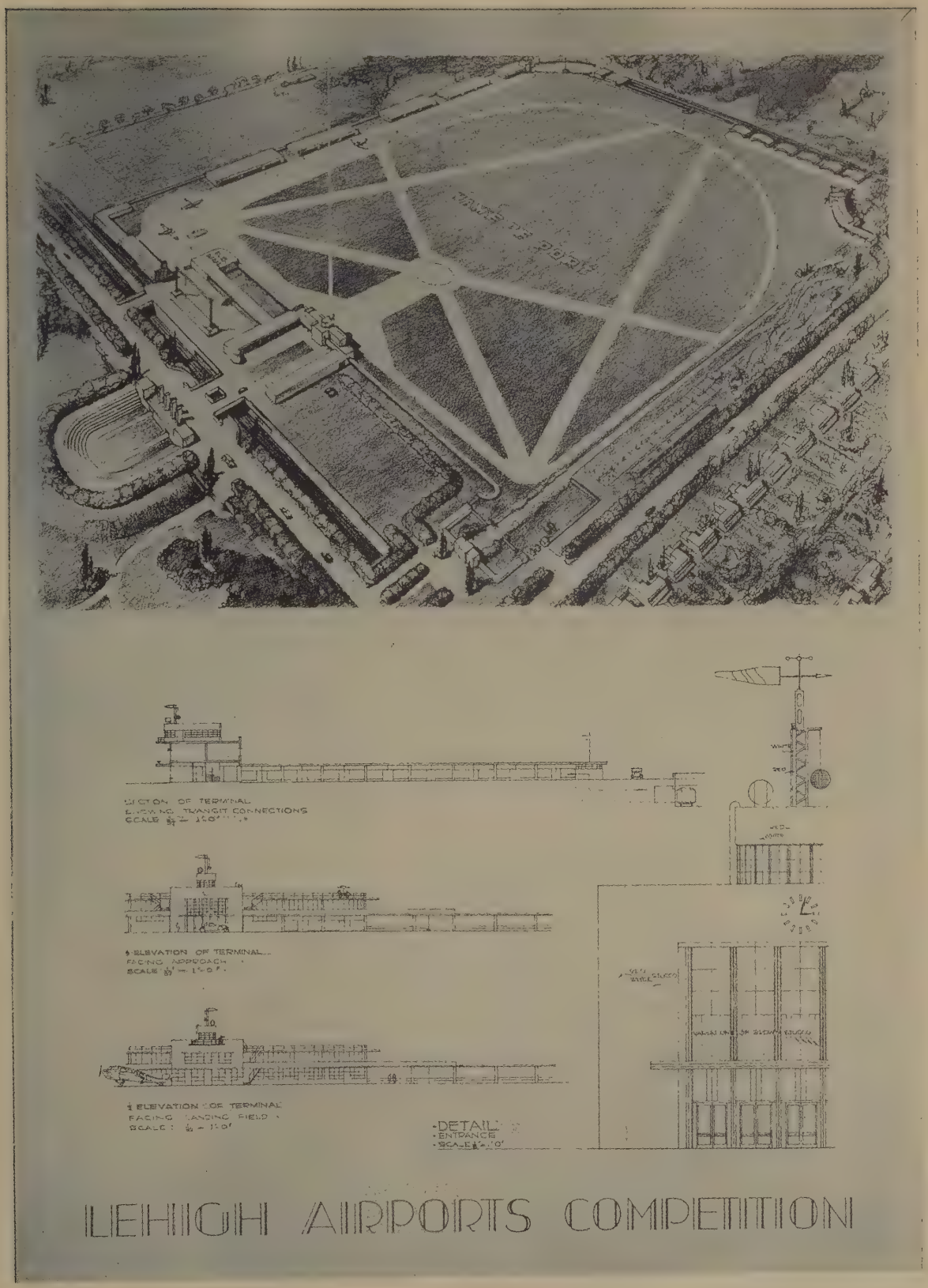
Designed by H. L. Gogerty, Architect and Engineer, Hollywood, California. Skyscraper buildings of this sort, though of dramatic interest, are considered dangerous at airports



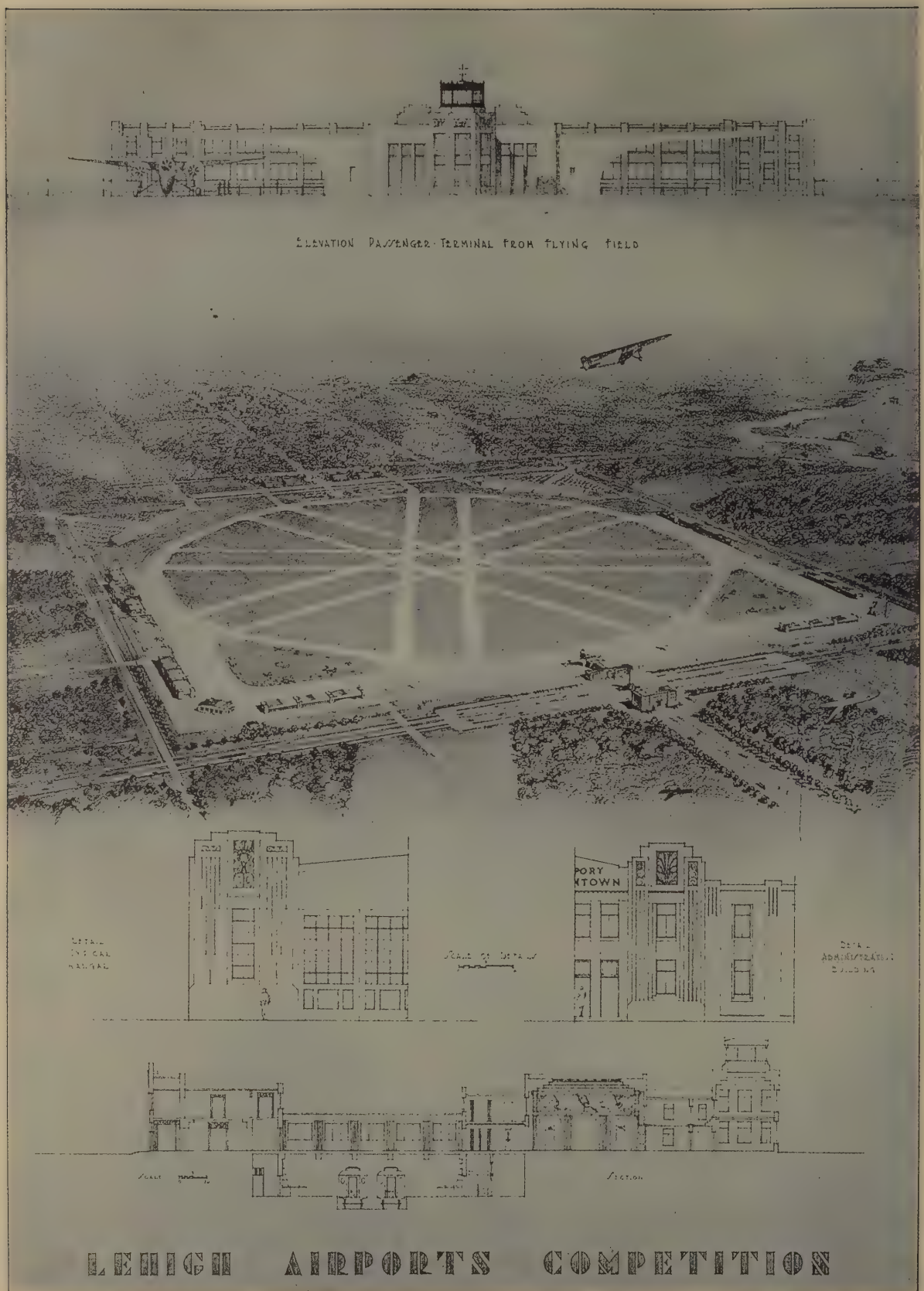
Designed by R. H. MacNaughton, Cleveland, Ohio. The passenger terminal itself is used as the loading point by providing underground approach from the public plaza



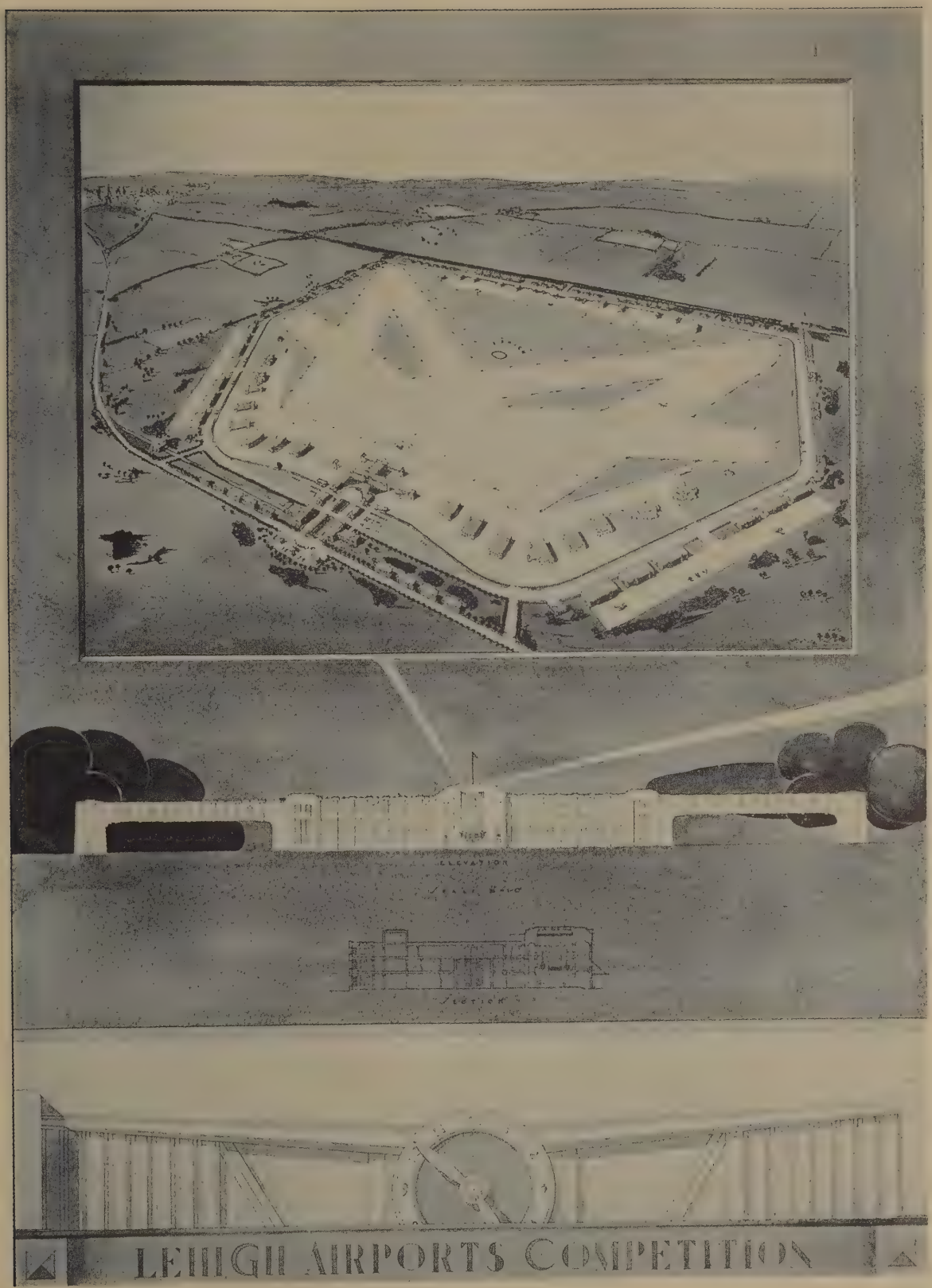
Wesley S. Bessell, Architect, New York, N. Y., has placed his hangars and loading docks to separate the flying field from the working area



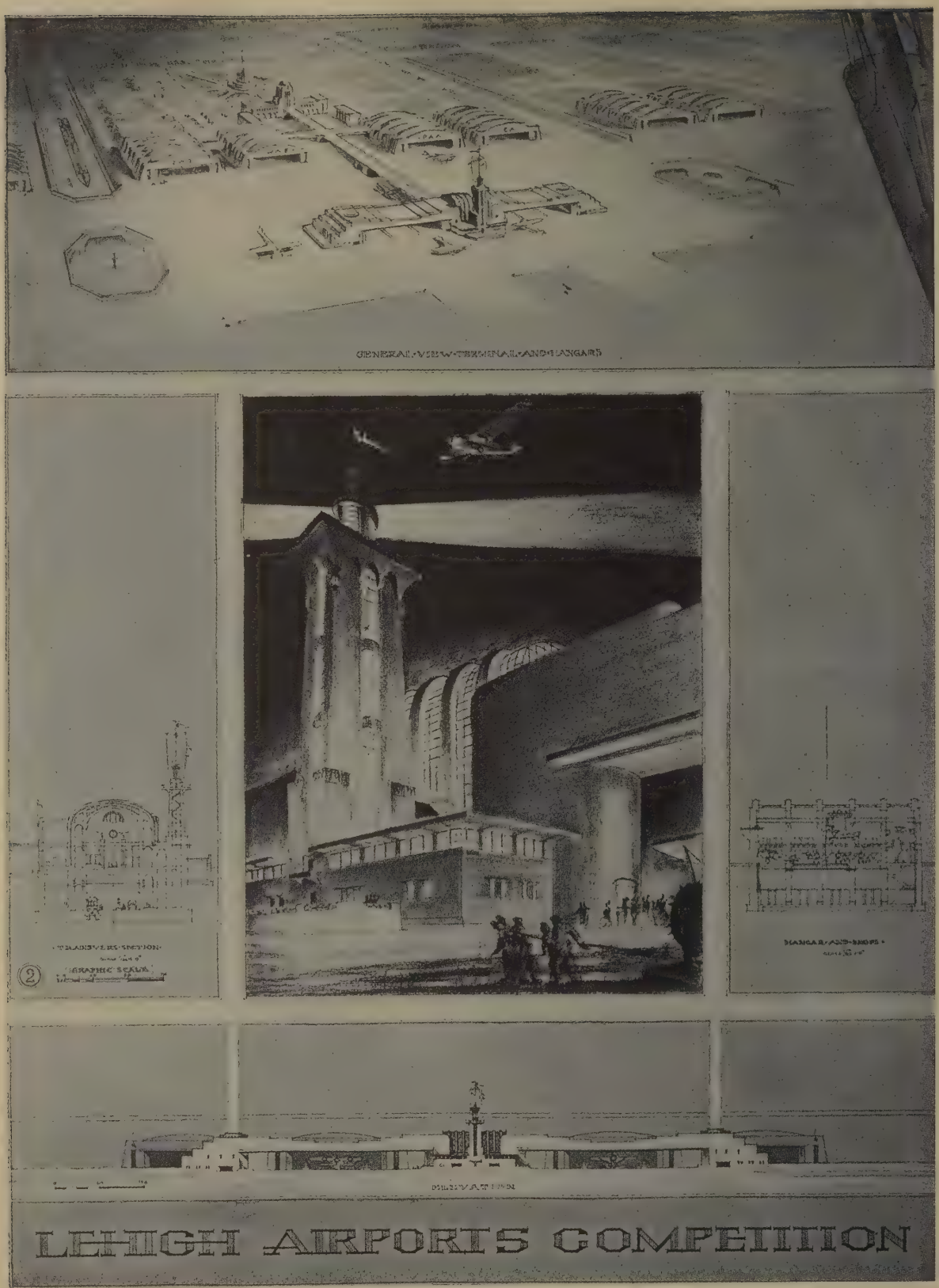
In this design, Alfred Kastner, Architect, New York, N. Y., has segregated all hangars in one corner of the field adjacent to separate express and mail handling stations



Designed by Raymond M. Marlier, Architect, Pittsburgh, Pa. Cantilever-roofed loading docks have the advantage of limiting only the size of planes but not their wing span



Designed by Charles R. Lotarius, New York, N. Y. A double set of loading docks increase the terminal capacity, but require tractors to maneuver the planes



The structural design of the buildings shown in this conception by Thomas H. Locraft and Robert C. Danis, Washington, D. C., is of particular interest

ANALYSIS OF DESIGNS

By ARCHIBALD BLACK*

THE following comments and notes upon the designs submitted in the Lehigh Airports Competition which are published in the foregoing pages are presented for the benefit of the serious student who desires to analyze these conceptions with a view to making practical use of their most valuable features. It must be appreciated that no single plan is beyond criticism, nor is any single scheme universally adaptable. The full value of this competition will only be achieved if these designs are accepted as suggestions and inspirations which may foster a more comprehensive study of airport planning and assist in creating a public acceptance of the idea that a true airport must be planned and equipped with the care which has attended the creation of other types of important transportation terminals.

When studying these drawings for features applicable to any specific airport problem the reader should bear in mind that economic considerations and the available land area may require considerable modification of the ideas presented. The runway lengths established in the competiton are highly desirable if they can be obtained, but are greater than present minimum standards demand. Likewise, the structures indicated may be more costly or elaborate than can be justified today, though future growth may result in even further development than is shown in some cases. On the other hand, the hangar space called for in the contest rules may be inadequate for many active ports. The reader should keep such considerations constantly in mind.

In the notes following, no effort has been made to give a detailed analysis of the features of every design. Rather these remarks take the form of a running commentary upon the designs in the sequence of their appearance in this book. Only the more outstanding points are discussed and, to avoid repetition, features considered in the first notes are passed over without further comment where appearing again in subsequent designs.

First Prize ' ' ' A. C. ZIMMERMAN AND W. H. HARRISON ' ' ' *Pages 14 and 15*

The outstanding features of this design are the quadrant shape of the flying field itself, the unusual runway layout and the star-shaped loading and unloading arrangement. Each of these features represents courageous effort to solve ever-present problems of airport design. This loading system impresses one as having promising possibilities and the location of the control tower on top of the loading building is very good. The whole design possesses unusual symmetry and is very well landscaped, but there may be some question of the practicability of devoting so much area to landscaping and park use if the project is other than a municipal one. This will depend largely upon property values and landscaping costs.

Aeronautic Features. The eight runways have been arranged within the quadrant-shaped field to provide sixteen take-off directions or double the requirements of the competition and of the Department of Commerce. The layout represents a praiseworthy effort to provide for take-off almost directly into the wind without having to abandon use of the runways at times. At first impression it would appear the courses of landing and taking-off aircraft will occasionally cross and this will be true if standard traffic rules are enforced. Upon careful study, however, it becomes evident that runways can be assigned for taking off and landing so that the courses of aircraft separate instead of converge—providing we abandon the proposed rule of always landing on the right-hand runway and always taking off from the left-hand one. With adequate signal system and with such large area, this would be a minor objection but a more serious one in the case of a smaller field. The central runway heads towards the loading building with its control tower but could be moved to the one side or built as two parallel runways in a smaller field. The great length of runways required by the competition makes this proximity to the building a minor objection here but one which becomes important in a smaller plot such as that of the average airport.

The general plan is excellent from the transport operator's viewpoint but the very limited accommodations for other commercial flying activities should be considerably increased in order to justify the construction of an airport of the size required by the competition rules. In projects of such magnitude it would also seem wise to provide for exceptional crowds such as would be present during flying meets.

The disposition of the hangars, while entirely logical and in accord with approved current practice, places them further apart from each other than would be necessary for planes having wing-spans which could be accommodated within the hangars themselves. Reducing the space between them would considerably increase the potential capacity of the field by leaving space for more buildings. Excellent provision has been made in the basic design for fencing the airport and segregating visitors and passengers from the field.

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The loading point is of exceptional interest and its principal features are graphically presented in the frontispiece. The use of retractable steel canopies permits the maneuvering of airplanes under their own power while the tunnels are retracted. The tunnels may then be extended to the door of the airplane without interfering with motor nacelles, propellers, or wings. By extending the tunnels in length, very large airplanes may be accommodated without increasing the size of the structure. However, it has been noted that maneuvering planes under their own power, even on a hard paved apron, creates a great deal of dust which might readily be blown toward the terminal building and into the spectators' areas on either side as well as upon the observation terrace in front.

General Plan. Approximately twenty-two per cent of the property has been used for parking purposes and for buildings other than those directly needed for airport operation. Nevertheless, a considerable part of this area is devoted to automobile parking and to adequate roads providing direct access to the terminal and to the parking space. The hotel is fairly well segregated from the center of noisy activities, and the recreation facilities seem to be well placed. The extension of these recreation areas and the establishment of miscellaneous concessions would add to the value of this design as a municipal enterprise. If the concessions were further developed to occupy more of the parked areas, they would contribute substantially to the income of the port.

The designers' conception of a special entrance to the terminal building to be used by owners of private planes is not in accordance with the opinions of those engaged in aviation, most of whom believe that private flying should not be associated with commercial flying. This feature of the arrangement would create a rather undesirable traffic condition which might be very difficult to bring under control.

Second Prize . . . . *Pages 16 and 17*

C. GIFFORD RICH

This plan presupposes a certain shape of plot, consisting of a square with an abutting triangular area, and hence would require some modification in other cases. At the same time, it incorporates certain features worthy of consideration in all cases. One desirable feature is the arrangement of the runways so that their intersection is near the administration building. This would require considerably less taxiing than would be necessary with most of the other designs.

Aeronautic Features. The flying field is rectangular in shape and is equipped with four single runways crossing at a point midway between the center of the field and the passenger terminal and providing eight directions for take-off or landing. Near the ends of these runways is a circular taxi strip which serves to keep arriving and departing planes off the runways, except when they are actually taking off or landing. Expansion of this field is not indicated but could be provided for by reversing the runway plan and establishing another crossing point on the opposite side of the center of the field. This would provide parallel runways in all directions, permitting simultaneous take-off and landing. Two of these future runways, however, would head for spaces which should be reserved for future hangars. While not objectionable in a plot of this area, such condition would be undesirable in a smaller plot. The flying field design is good with the exception that two of the corners of the property are not used to fullest advantage unless the parallel runways are to be added.

The location of the towers shown in the perspective places them approximately at the ends of two major runways. They are intended to carry ceiling projectors and for temporary use to support radio aerials —the design indicates that the permanent radio station should be one mile from the airport. It would seem that the towers could be dispensed with because a ceiling projector could just as well be mounted on the roof of a building such as one of the hangars. There appears to be no particular justification for combining three hangar units in a single group. The latter feature introduces a fire hazard which might offset any economy of construction.

The airport terminal is equipped with covered loading and unloading bays formed by wings extending on either side of the concourse. This type of construction has its merits but is open to the general objection of limiting the wing span and the height of airplanes which can use the bays.

General Plan. All major airport activities are confined within a rectangular flying field from which unauthorized visitors are restricted by a surrounding fence at the edge of the marginal strip. Other associated structures, together with commodious automobile parking spaces occupy a triangular plot of ground formed by the intersection of two main highways which the designer has assumed to be present. Unusual crowds, such as at a flying meet, would have to be provided for in front of the parked cars. If the area in front of this space is used for future hangars some radical changes might be necessary. Only a few secondary buildings, including a hotel, recreation structures, stores and apartments, have been indicated, but adequate space is left for their future development. An electric spur-line has been brought around the field in such manner as to provide freight and express service to the hangars, and passenger service directly to the terminal.

The lighting of the airport has been carefully studied and includes flush surface lights placed along the center line of each runway; and a mercury vapor light which forms the crown is an architectural feature of the terminal itself.

Third Prize . . . . *Pages 18 and 19*

ODD NANSEN and LATHAM C. SQUIRE

The distinguishing feature of this design is the complete segregation of airport activities, which are confined within the boundaries of a normal rectangular field and separated from secondary or associated activities which may subsequently develop to form a great recreation center adjacent to the port.

Aeronautic Features. This is the first of the prize plans to provide a parallel runway layout. These runways are arranged within an almost square landing area and serve to separate incoming and departing airplanes at a sufficient distance so that there should be no danger of collision. Diagonal taxi strips at the corners of the field and a marginal taxi lane completely around the perimeter provide direct access to and from the ends of the runways. None of the runways approach any building directly.

The passenger terminal building is situated in the center of a large rectangular area and is equipped with two pairs of covered loading and unloading docks which are susceptible to the same objection mentioned with respect to the second prize design; namely, that they physically limit the size of airplanes which can use them. In order that the terminal building may offer the minimum of obstruction to flying, its major elements have been set down below the field level, and its approach is through an underground concourse from the adjacent recreation center. The hangars are located in back of the terminal building, and the general layout of the maneuvering space necessitates paving a very considerable area of land. This constitutes a feature that is not economic.

The designers have made separate provision for transport airplanes, private airplanes, National Guard operations, and other miscellaneous flying activities, and have reserved their passenger terminal for commercial operation. This is a distinctly good feature of the layout, for, while it is true that we may require separate airports for these in the future, it is generally very desirable to provide for each activity at present. Schools and private airplanes should be segregated.

The general layout shows a keen appreciation of airport requirements. The civic center pictured is an elaborate scheme looking far into the future, but it is so designed that each element can be added as traffic growth demands. The design suggests a very complete development of concessions, an amusement park, recreation areas, and other features that may logically be associated with an airport and which may readily contribute income toward its support, or it may be a separate project.

Fourth Prize . . . . . *Pages 20 and 21*

WILL RICE AMON

This design employs a circular flying field developed upon an irregular property of such shape as to invite the introduction of a flying school, club and airplane manufacturing facilities, in addition to the appurtenances of a typical transport terminal. Some of the features (such as the club and school) might be criticized as tending to promote amateur flying at an airport designed for transport and other commercial flying. On the other hand, where these features must be included it is well to segregate them as this plan does and this point is very commendable. The double runways possess all of the merits of the same feature in the preceding design, but the excessively broad circumferential taxi strip implies a construction expense out of proportion to its value.

Some of the buildings are located across the ends of runways—a condition which, as already mentioned, should be avoided in most cases. At present, the planes are required to taxi completely around the hangar group in spite of the fact that it is desirable to minimize the amount of ground travel of big airplanes. Obviously, if the hangar group is to be enlarged in the future, this condition will be aggravated. Adequate hangar expansion does not seem to be provided for in this plan, considering the exceptionally large plot.

The design of the terminal is very interesting, but the loading bays are of the covered type, imposing definite limits upon the size of transport planes which may use them. The relation of the passenger terminal to the public plaza with its stores, shops, hotel and other income-producing properties, is very natural and logical, while the provision of parking space not only in this plaza but also at one side of the field where it serves the playground and amusement area is commendable.

The plan of the passenger terminal could be improved by changing the pilots' lounge to the upper floor and locating the dining room and public toilets on the ground floor. There is some disproportion in the amount of space devoted to the service elements, particularly the dining facilities, which experience indicates should be considerably larger than those provided in this plan.

Honorable Mention . . . *Pages 24 and 25*

W. FRANK BOWER, JR., HENRY L. SANDLASS, ALFRED A. ROTHMANN

This design assumes the use of a special shape of plot of very great area with double runways along the diagonals, a double runway parallel to the front of the terminal building, and single runways around the three other sides of the field. While this scheme gives a maximum segregation of traffic when the single runways are used, it brings the planes dangerously close together when the double runways are employed, because the latter are set too near each other for practical safety. Wing spans are increasing so rapidly that with all of the space at the designer's disposal, it would have been much better to separate the arriving and departing lanes by a space several hundred feet in width. Placing runways along the perimeter of the field is also subject to criticism in that it brings the flying activities close to adjacent structures which are likely to produce unsteady wind currents.

A point of interest is the design of the airport buildings and their arrangement in a manner which allows for considerable expansion of both flying activities and concessions which contribute to airport income. On the other hand, the fixed bay loading system is again shown. The passenger terminal building employs covered loading and unloading bays which project toward the center of the field and which terminate in a control tower. The traffic control facilities are thus brought into the most logical relationship to the field and the control structure provides space for radio and weather stations, as well as for pilots, inspectors and other operating officials. Ample provision is made for the crowds attracted by flying meets and the arrangement of the facilities for spectators is very good, although there seems to be no need for duplication on opposite sides.

Honorable Mention . . *Pages 26 and 27*

H. ROY KELLEY

The arrangement of the runways on a rectangular airport site is one of the chief features of this design. The plan provides for initial requirements with single runways and at the same time makes provision for doubling the field capacity by the future installation of parallel runways. The designer has also indicated the use of paved runways bordered by secondary pavement, an important feature which increases the effective width of the hard-surfaced runways at low cost. The arrangement of hangars flanking the passenger terminal is logical, but they slightly interfere with control tower vision, and future expansion would

require other hangars to be built more remote from the center of activities. The loading space for taxi planes and joy hops could probably be better used as a site for a future hangar and have this type of flying ultimately transferred to another part of the field.

The terminal itself employs the retractable canopy method of protecting passengers between the airplane and the waiting room in a manner somewhat similar to that shown in the first prize design. Considerable parking space for automobiles is provided adjacent to the public and semi-public buildings which occupy one corner of the airport site, but it is doubtful if this space is quite adequate. The whole arrangement makes no provision for flying meets.

Honorable Mention ' ' ' *Pages 28 and 29*
JAMES S. NUSSEAR, JR., *Architect*
WILLIAM N. S. PUGH, *Associate*

This design has an unusual feature in the irregular disposition of the runways. While not entirely obvious, it seems most probable that this plan was evolved to represent conditions, such as are generally found in practice, where surroundings affect the runway location. Most of the other designs completely neglected the effect of local conditions and surroundings. In other respects, this design contains some of the good points and some of the faults previously discussed.

The placement of hangars at right angles to the maneuvering area, with doors on either side and connecting aprons between, conforms to some examples of good present-day practice. The plan is so devised that the main passenger terminal is brought in close proximity to the principal highway, while a private road paralleling the highway is added to segregate the traffic serving the port. Parking has been indicated for nearly three thousand cars, and special attention has been given to placing the fire equipment and ambulances in such manner as to reach the field or the highway with equal facility. Special attention should be paid to the arrangement of the roadways serving the airport buildings, because they have been carefully planned to give positive control of traffic reaching the field, while providing adequately for the miscellaneous trucking to every building. On the other hand, two corners of the airport area have not been fully utilized, being assigned to mooring out, although exceeding the area required for such purposes.

Honorable Mention ' ' ' *Pages 29 and 30*
EDWARD C. REMSON

This circular field is of the cartwheel pattern, except that double runways are provided along the axis of the main terminal building to prevent the necessity for airplanes flying toward this structure and to provide for the separation of incoming and departing planes in the direction of the prevailing wind. The plan is very generous in the amount of space occupied by the port, because the designer has felt it desirable to create parking and recreation areas, including a huge athletic field, golf courses and playgrounds, both as income producers and to permanently protect the marginal strip from future encroachments. The plan, therefore, is more appropriate to a municipal field than one of purely commercial character. All hangars are disposed along the perimeter of the field, flanking the terminal building but are separated from the latter by terraces reserved for public observation of flying activities. The seaplane base which is combined with this airport is a secondary feature, of interest where the airport site can be located adjacent to a sizable body of water. Such a base, however, should have closer association with the passenger building.

Honorable Mention ' ' ' *Pages 32 and 33*
GEORGE A. ROBBINS

This is another double runway field of octagonal shape. The elements of principal interest are the combination with a seaplane base, very generous automobile parking areas, the placement of the hangars, and the location of the passenger terminal building. The passenger building projects out toward the field in advance of the hangars and has enclosed passageways leading out on either side to the paved apron where planes can taxi into position. No attempt is made to carry these passages into direct contact with the airplanes, but the arrangement shown requires a minimum amount of maneuvering. It combines economical construction with reasonably good protection to travellers from inclement weather and exposure to propeller blasts. Automobile traffic to and from the passenger terminal is provided for by a spur road from the highway. In general, this plan, like some others, may be criticized for its excessive use of land for the protection of the flying field. Part of these areas are employed for recreational and income producing sites, but their proportion could well be reduced.

Honorable Mention ' ' ' *Pages 34 and 35*
ROBERT PAUL SCHWEIKHER

Here again we find the cartwheel layout of a circular flying field which employs double runways set well apart from each other. Of chief interest in this plan is the suggestion for the segregation of all of the hangars at a point somewhat removed from the passenger terminal building and considerably removed from the hotel and other public structures. This plan does not offer adequate parking space for automobiles, the only space indicated for parking purpose being a small circular court. The designer has suggested a novel method of loading and unloading passengers from airplanes through the use of underground passages to a pair of canopies or passenger slips at the edge of the flying field. This is a feature which seems to offer considerable promise. The architectural treatment of the passenger terminal is ultra modern.

Honorable Mention ' ' ' *Pages 36 and 37*
FRED E. SLOAN AND ELMER E. JOHNSON

The flying field shown in this plan is a modification of the Triarc pattern for which patent application has been made by Gavin Hadden, civil engineer of New York. The designers, however, have suggested the use of double runways set rather close together in a pattern suggesting that shown on page 26, instead of adopting the idea there shown of reversing the field plan to provide parallel runways which would be more safely separated from each other. A considerable amount of space has been taken for a very broad paved apron serving the hangars and the passenger terminal, increasing the cost of construction out of pro-

portion to the benefits gained. It is worthy of note that runways have been carried to borders of the field, although the intersection of taxi strips nullifies to a certain extent the value of the long runways. Unusually liberal provision has been made for parking of automobiles, in keeping with the demand for such space which is already apparent at every active airport. On the other hand, it would seem that additional hangars could be used in the future and the mooring space appears larger than necessary.

Honorable Mention *Pages 38 and 39*

LLOYD N. F. SPICER

This simple and logical field layout provides for doubling the traffic capacity of the port by adding parallel runways in the future, a feature distinguishing the design. Other features are the location of parking and public areas on either side of the passenger terminal, providing observation points for many visitors and the grouping of hangars in parallel lines at right angles to the paved apron which joins them to the passenger terminal. The design suggests the use of a broad marginal strip around the field for airplane mooring and indicates that this area is paved. Such paving would be an unnecessary expense, and the area is much greater than likely ever to be required. Loading facilities seem to be a single bay shelter with a platform suggesting that of a railroad station. The latter, of course, would only be a nuisance in this case.

Honorable Mention *Pages 40 and 41*

EDWIN M. STITT

This cartwheel layout would be improved by separating the parallel runways somewhat further, as suggested in the design on page 34. Of chief interest is the scheme for passenger handling which involves the use of a series of tunnels beneath the paved loading apron, with elevating canopies which rise from the field level over staircases leading from the tunnel to the surface. This is a further development of the plan shown on pages 34 and 35 and is a very promising idea. When a plane has been brought to the loading and unloading point, a surface switch automatically brings the canopy into its elevated position, and when the plane is about to leave, the canopy may be again lowered for safe taxiing over the surface. A similar tunnel, equipped with baggage elevators is used for mail and express and by the pilots. As part of this conception, the main concourse of the passenger terminal is below ground level. The plan also presents an interesting hangar design with a cantilevered roof truss and outswinging doors pivoted at the top.

Honorable Mention *Pages 42 and 43*

CHARLES A. STONE AND U. FLOYD RIBLE

In addition to the very interesting architectural treatment suggested for the terminal building, this design contains many features already discussed in previous notes. It is subject to criticism for the unusually wide apron completely encircling the field, for the hexagonal-shaped hangars, and two runways heading directly toward the crowds of people seated in the stadium. Interesting features are the close association of airplane manufacturing and sales buildings, the development of a large amusement park, the athletic field with its stadium facing the airport, the suggestion for a flying school separate from but adjacent to the airport, and the provision for airplane mooring.

Honorable Mention *Pages 44 and 45*

ROBERT D. STOTT, HOWARD HUTCHINSON AND LANSING C. HOLDEN, JR.

Here is a circular field with broad runways combined with the entirely novel conception of carrying the runways over the roofs of partly submerged hangars which encircle the perimeter of the field. The entrances of these hangars face a marginal apron, surrounding the field, and below the field level except where the apron rises by means of broad ramps to the passenger station and loading point. Intermediate ramps connect this marginal strip with a circular taxiway connecting all of the runways. The field is graded so that its low point is at the center and its higher elevations are around the rim, giving it a saucer shape which tends to slow up planes that are landing and to give added impetus to planes taking off. This design also facilitates floodlighting and offers excellent approaches. However, the ramps appear to be rather steep for airplane operations unless tractors are used. Unusual provision has been made for automobile parking. The suggestion of so completely separating freight, air mail and passenger units is interesting, but its use would become practical only where each type of traffic is carried in separate airplanes.

Honorable Mention *Pages 46 and 47*

VIRGIL WESTBROOK

Double runways are provided in two directions with single runways crossing them diagonally at their intersections. Transport hangars are arranged in parallel rows framing either side of a broad paved maneuvering apron, at one side of which is the passenger terminal with two loading bays set at angles to the main structure. The plan provides ample parking space for automobiles, but is rather too generous in the amount of land devoted to an entrance plaza and for the mooring of airplanes around the margins of the field. Transport loading facilities appear to be limited to two airplanes.

H. ALTVATER *Page 48*

A visionary scheme published for its originality rather than for any elements of practical utility. Obviously, this plan would involve excessive danger in use.

WILLIAM N. GILLETTE *Pages 50 and 51*

In order to provide runways of the specified length, this scheme requires about double the land area of any of the foregoing plans without any compensating features. It has been included here because of the original arrangement proposed by the designer rather than because of its practical value.

Captain Frederic Bowne and Fernand Aubry, Mann & MacNeille and James Renwick Thomson ▾ ▾ ▾ *Pages 52 and 53*

A practical and interesting development of the cart-wheel layout with double runways is presented in this design. Each runway joins the circumferential taxi strip at only one end, thus automatically indicating to the pilot in the air which strip should be used for landing. It is also evident that the designers intended to use different construction for the two types of runways. Placing the hangars in a separate area reached by bridges over the main highway involves expensive construction and creates two traffic "bottle necks" and requires considerable taxiing, but has the same merit of separating service work from flying activities that the roundhouse and freight yard contribute to typical railroad terminals. While the general plan evidently represents careful consideration of airport elements, it requires a considerable area of ground.

John Theodore Haneman ▾ *Pages 54 and 55*

Parallel runways are shown, some of which are made broader than others to care for the heavier traffic anticipated by prevailing winds—a feature of doubtful value. Here again the hangars are separated from the flying field, being reached through a "bottle neck" at the passenger terminal. This necessitates long underground automobile approaches to the passenger terminal from the main highway. The covered loading bays in this plan are of such size as to accommodate extraordinarily large airplanes but therefore represent an increase in cost of their construction.

J. Roy Carroll, Jr., and Donald Barthelme ▾ *Pages 56 and 57*

A great deal of careful study is evidenced in the development of this design which provides with extraordinary care for future expansion upon a very great scale but which requires tremendous area even at the start. Turntables are provided for handling transport airplanes beneath the huge cantilver-roofed loading and unloading bays. These represent some very original ideas although the application shown would run to rather high cost.

Richard Haviland Smythe ▾ *Pages 58 and 59*

Aside from its very commendable architectural treatment and the organization of its building units into large groups, this plan is significant as an indication of secondary development of runway flying fields. Some airport designers today believe that the eventual airport treatment will require an all-over hard-surfaced field. This design shows paving over approximately one-half of the field surface with the area so arranged as to provide maximum safe landing strips in the direction of the prevailing winds. For present uses the construction cost would be prohibitive.

H. T. Holcomb ▾ ▾ ▾ ▾ *Pages 60 and 61*

The general scheme for this airport closely resembles that of the honorable mention design on pages 44 and 45, except that it uses multiple runways carried over to circumferential hangars partially sunk below the flying area. Its distinctive feature lies in its placing of the major loading point in the center of the field where it can be reached only by extensive underground concourses. Centrally located buildings of this type are considered generally inadvisable from the flying viewpoint, because they bring the important runways close to the building no matter what wind is prevailing. The use of four sets of parallel runways, however, represents a possible future development.

Howard Bordewich and Wm. F. Koenig ▾ *Pages 62 and 63*

Here a vast amount of land area is utilized for loading and unloading airplanes, for the hangars and for other service units. Interesting features are the revolving turrets which are employed in lieu of loading bays. These are reached by underground tunnels from the passenger terminal. After an airplane has maneuvered into position near the turret, the latter is swung around behind the wings to the door of the airplane. An excessive amount of taxiing or maneuvering of planes by means of tractors is required by the disposition of these units and its use would involve considerable minor troubles in addition to excessive cost.

Fred Fornoff ▾ ▾ ▾ *Pages 64 and 65*

A triangular-shaped field is suggested in this design as a basis for eventually developing multiple units which will greatly increase the capacity of the flying field, while keeping the separate passenger stations and public areas in close proximity to each other and to connecting highways. The architectural treatment of the buildings is carried considerably beyond the point of economic justification and the loading system would cause the propeller blasts to sweep the entire building line as the airplanes are being moved. Loading capacity is also very limited, considering the high cost of construction involved.

K. L. Hayden ▾ ▾ ▾ ▾ *Pages 66 and 67*

This plan presents a field layout which obviously has been studied to minimize the taxiing distances of planes using any runway. There is a commendable economy in the distribution of paved areas and in the indicated use of secondary border pavements. Perhaps of chief interest, however, is the suggestion for loading passengers by means of tunnels leading to staircases that are roofed with counterweighted cantilever hatch covers. When one of these is lifted to its elevated position, it forms a canopy protecting the passengers from the weather, and when lowered, constitutes a part of the apron surface. This feature is one which deserves consideration.

M. E. Boyer, Jr. ▾ ▾ ▾ *Pages 68 and 69*

Like the preceding plan, the design here shown seeks economy in the use of paved areas and in establishing minimum taxiing distances. Neither plan is susceptible of expansion by the introduction of double runways. This design suggests concealed loading turrets which rise from the pavement level and turn into position toward the door of airplane which has previously been maneuvered close to the loading point. As previously mentioned, the addition of the turrets to the underground passageways does not seem as practical as the simple hatchways.

CLARENCE L. JAY . . . *Pages 70 and 71*

This designer suggests the use of hangar-like structures for the loading and unloading of passengers and baggage. These are structures enclosed on three sides, within which the airplanes are turned about before departing, by means of floor turntables. While an interesting proposal, this plan involves considerable cost.

JAMES LEONARD CANNON . *Pages 72 and 73*

Of chief interest is the striking architectural design of the terminal building with its covered loading bays having overhead passages and observation space. The plan is exceedingly wasteful of land and calls for excessively large paved areas. Most of its runways lead directly toward buildings and the whole design lacks a sense of proportion between facilities provided.

CHARLES L. NORD . . . . . *Page 74*

The runway plan presented in this design shows a complete development of the Triarc field pattern to which reference has previously been made. The layout shown in the perspective indicates the initial development of runways, while the small block plan (introduced on this page from the designer's second drawing) indicates the future development of the field with double runways in six positions.

BEBB & GOULD, *Architects;* . . *Page 75*
JACK PATERSON, *Associate*

Subterranean approaches lead to a fairly low passenger terminal which is projected well into the field in a sector formed by two pairs of parallel runways. This plan is typical of a number of competition designs which endeavor to utilize the land areas between intersecting runways. They all possess the same disadvantage of bringing fast moving airplanes utilizing the runways in close proximity to airplanes that are taxiing about the terminal building or the hangars. While some such arrangements are often forced upon the designer where the plot is small, the layout of runways in this design has not been planned to best advantage for this purpose.

ARTHUR B. GALLION . . . . . *Page 76*

The unique feature of this conception is the provision of a sloping semi-circular turning space which is designed to assist planes that have passed through the unloading bays to turn about and enter the field again through the covered loading bays.

ROBERT C. DEAN . . . . . *Page 77*

A triangular field of large capacity served by double runways, three pairs of which are directly accessible to the terminal and hangars. No provision is made for taxiing to the far ends for take-off in the reverse direction. The modernistic loading points which are carried out into the maneuvering apron are designed to express the modern spirit of flight.

MAJOR EDWARD M. URBAND . . . *Page 78*

Although buildings of apparently considerable importance have been located opposite the ends of the runways, it is worthy of note that a broad marginal strip separates the flying lanes from the border of the airport, thus overcoming the chief disadvantage of square fields having runways around the edges. Considering the great scale of modern airports, this plan is subject to criticism because it disposes the hangars around the field at points considerably remote from the center of flying activities and it does not utilize the large area to best advantage.

NORMAN L. WILKINSON AND . . *Page 79*
ALFRED W. HERTZ

Practically all of the major features of this design have been discussed in preceding analyses. There is an interesting suggestion that, where possible, highways are located as extensions to runways, thus physically forestalling the establishment of tall buildings directly on the axes of such runways. This feature, however, is of rather doubtful value. The design introduces many secondary activities in the land areas surrounding the airport, all of which are designed to contain buildings of comparatively little height.

WALTER J. CAMPBELL . . . . *Page 80*

Here the roof deck of the huge, covered loading bays has been made a public promenade and outlook point. While this is an interesting feature, the cost of building these bays to carry the weight of spectators does not seem to be justified.

BRITTON KIRTON . . . . . *Page 81*

This is another plan suggesting the use of hangar roof-decks for public observation. Both this plan and the one preceding have the merit of allowing convenient and safe public view of airport activities, but as already mentioned they add to the cost of construction. The huge tower is exceedingly dangerous and quite unnecessary.

H. L. GOGERTY . . . . . *Page 82*

Though meritorious for its architectural design and rendering, and for its wide separation of parallel runways so that none pass close to the passenger terminal or hangars, this design is subject to two criticisms. First, for its use of a centrally located group of structures requiring an extensive underground approach, and second, for the employment of a huge tower as the central feature. The first fault is an economic one, while the second is based upon the universal objection of all men of flying experience to tall obstructions anywhere near an airport site.

R. H. MACNAUGHTON . . . . *Page 83*

The passenger terminal shown in this design is built mostly below the level of the flying field and is approached through a public plaza at its lower level. A novel feature conceived by the designer is the manner in which planes may pass completely around the terminal for loading and unloading on either of its two principal sides.

WESLEY S. BESSELL . . . . . *Page 84*

This plan is typical of several designs which used a practically continuous row of hangars to separate the flying field from the space reserved for maneuvering, fueling and loading transport planes. The creation of a "bottle neck" through the loading and unloading bays is avoided by separating the blocks of hangars at two points for access to the maneuvering apron. The opportunity for expanding hangar facilities is correspondingly limited. Cantilever construction is proposed for the roof trusses.

ALFRED KASTNER . . . . . *Page 85*

Hangars are separated from the terminal building and placed near one corner of the flying area. While this provides for centralized fueling and for separate loading for freight and mail, it requires an excessive amount of taxiing due to the hangar positions. The forecourt of the terminal building is flanked by stores and shops, and beneath them is a railroad station. An excessive amount of space has been provided for freight and mail handling. However, suggestions can be obtained from this design for a variety of ways in which the marginal areas may be developed for income producing purposes.

RAYMOND M. MARLIER . . . . *Page 86*

This airport, like the preceding one, separates the hangars half the width of the field from the passenger terminal, requiring considerable taxiing or hauling by means of tractors to the loading point. The design of the passenger terminal is interesting; the cantilever roof over the loading docks having the advantage of not limiting the wing span of planes which use them. In many respects, the design incorporates features discussed previously in commenting upon other plans.

CHARLES R. LOTARIUS . . . . *Page 87*

The irregular placing of hangars to form a curved pattern and their disposition at the ends of important runways is illogical, although the designer evidently recognized the fact that airport plots are not regular in shape. By slight rearrangement, a great deal of space could be saved and the amount of paving considerably reduced. Two separate sets of loading bays are provided at the passenger terminal, but their proximity would require the maneuvering of airplanes by tractors.

THOMAS H. LOCRAFT . . . . *Page 88*
AND ROBERT C. DANIS

The architectural development of the building shown on this drawing gives it special interest. Overhead passageways connect the passenger terminal building with the principal hangars and with the covered loading bays that are projected well out into the field. The long-span roofs of the loading bays are designed like a suspension bridge suggesting a novel construction method that appears quite logical for such buildings. The roadways are carried under the airport, an interesting feature but one involving excessive construction cost that could seldom be justified.

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Foreword by Dominick A. Pisano, curator of the aeronautics department at the Smithsonian Institution's National Air and Space Museum, Washington, D.C.

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